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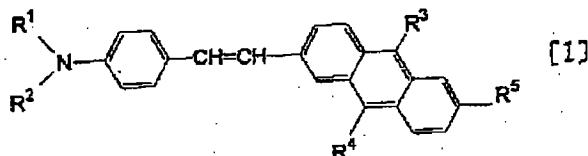
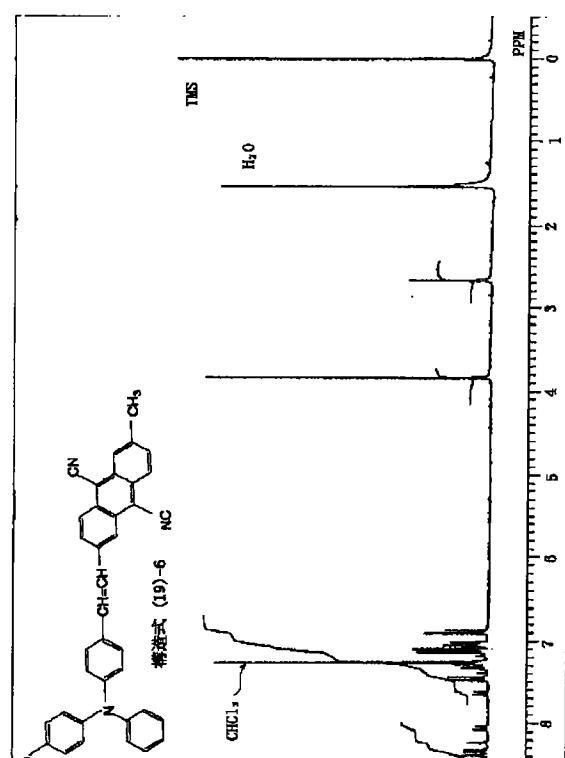
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(54)【発明の名称】 アミノスチリルアントラセン化合物及びその合成中間体、並びにこれらの製造方法

(57)【要約】 (修正有)

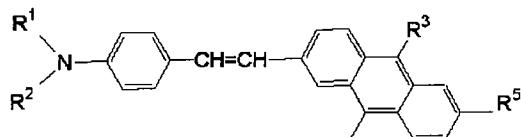
【課題】 安定かつ発光輝度の大きい黄色～赤色発光
を示す有機発光材料とその製造方法を提供する。【解決手段】 例えは一般式Iのアミノスチリルアン
トラセン化合物。これを、対応するアミノベンズアルデ
ヒドとホスホン酸エステル又はホスホニウム塩との縮合
によって製造する。〔R²は無置換のアリール基であり、R¹は種々の置換基
を有していてもよいアリール基、R³～R⁵は水素原子、
シアノ基、炭化水素基などである。〕

【特許請求の範囲】

【請求項1】 下記一般式〔I〕、〔II〕、〔III〕又は〔IV〕で示されるアミノスチリルアントラセン化合物。

【化1】

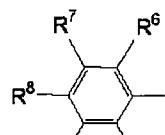
一般式〔I〕：



〔但し、前記一般式〔I〕において、R²は無置換のアリール基であり、R¹は下記一般式(1)で表わされるアリール基であり、

【化2】

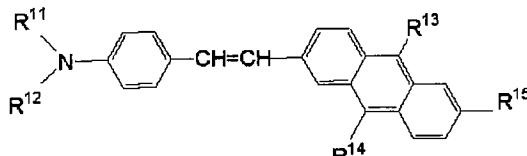
一般式(1)：



〔但し、前記一般式(1)において、R⁶、R⁷、R⁸、R⁹及びR¹⁰は互いに同一の若しくは異なる基であって、水素原子、炭素数1以上の飽和若しくは不飽和の炭化水素オキシ基、炭化水素基、炭化水素アミノ基、フルオロアルキル基、又は置換基を有してもよいアリール基である。〕、R³及びR⁴は互いに同一の若しくは異なる基であって、それらの少なくとも1つが水素原子、シアノ基、フルオロアルキル基、ニトロ基又はハロゲン原子であり、R⁵は水素原子、炭素数1以上の飽和若しくは不飽和の炭化水素基、又は置換基を有してもよいアリール基である。〕

【化3】

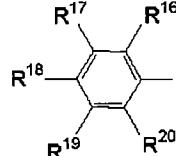
一般式〔II〕：



〔但し、前記一般式〔II〕において、R¹¹及びR¹²は互いに同一の若しくは異なる基であって、下記一般式(2)で表わされるアリール基であり、

【化4】

一般式(2)：

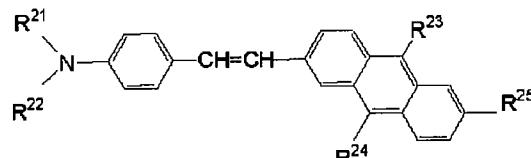


〔但し、前記一般式(2)において、R¹⁶、R¹⁷、R¹⁸、R¹⁹及びR²⁰は互いに同一の若しくは異なる基で

の炭化水素オキシ基、炭化水素基、炭化水素アミノ基、フルオロアルキル基、又は置換基を有してもよいアリール基である。〕、R¹³及びR¹⁴は互いに同一の若しくは異なる基であって、それらの少なくとも1つが水素原子、シアノ基、フルオロアルキル基、ニトロ基又はハロゲン原子であり、R¹⁵は水素原子、炭素数1以上の飽和若しくは不飽和の炭化水素基、又は置換基を有してもよいアリール基である。〕

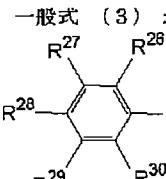
【化5】

一般式〔III〕：



〔但し、前記一般式〔III〕において、R²¹は下記一般式(3)で表わされるアリール基であり、

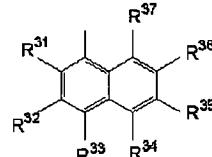
【化6】



〔但し、前記一般式(3)において、R²⁶、R²⁷、R²⁸、R²⁹及びR³⁰は互いに同一の若しくは異なる基であって、水素原子、炭素数1以上の飽和若しくは不飽和の炭化水素オキシ基、炭化水素基、炭化水素アミノ基又はフルオロアルキル基である。〕、R²²は下記一般式(4)で表わされるアリール基であり、

【化7】

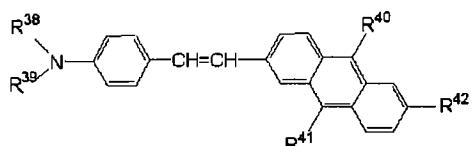
一般式(4)：



〔但し、前記一般式(4)において、R³¹、R³²、R³³、R³⁴、R³⁵、R³⁶及びR³⁷は互いに同一の若しくは異なる基であって、水素原子、炭素数1以上の飽和若しくは不飽和の炭化水素オキシ基、炭化水素基、炭化水素アミノ基、フルオロアルキル基、又は置換基を有してもよいアリール基である。〕、R²³及びR²⁴は互いに同一の若しくは異なる基であって、それらの少なくとも1つが水素原子、シアノ基、フルオロアルキル基、ニトロ基又はハロゲン原子であり、R²⁵は水素原子、炭素数1以上の飽和若しくは不飽和の炭化水素基、又は置換基を有してもよいアリール基である。〕

【化8】

一般式 [IV] :

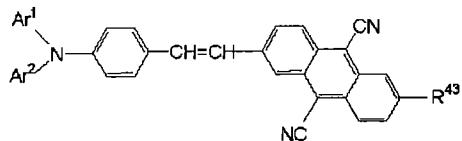


(但し、前記一般式 [IV]において、R³⁸及びR³⁹は互いに同一の若しくは異なる基であって、水素原子、炭素数1以上の飽和若しくは不飽和の炭化水素基である。)、R⁴⁰及びR⁴¹は互いに同一の若しくは異なる基であって、それらの少なくとも1つが水素原子、シアノ基、フルオロアルキル基、ニトロ基又はハロゲン原子であり、R⁴²は水素原子、炭素数1以上の飽和若しくは不飽和の炭化水素基、又は置換基を有してもよいアリール基である。)

【請求項2】 下記一般式(5)で表わされる、請求項1に記載したアミノスチリルアントラセン化合物。

【化9】

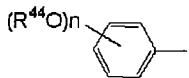
一般式(5) :



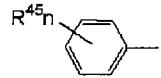
(但し、前記一般式(5)において、Ar¹及びAr²はそれぞれ、置換基を有してもよい互いに同一の若しくは異なるアリール基であって、置換基を有する場合には下記一般式(6)、(7)、(8)、(9)、(10)及び(11)で表わされるアリール基から選ばれた基であり、

【化10】

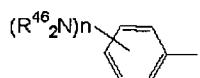
一般式(6) :



一般式(7) :

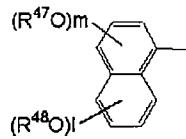


一般式(8) :

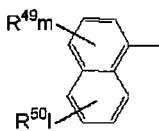


【化11】

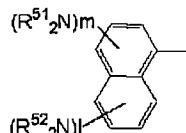
一般式(9) :



一般式(10) :



一般式(11) :



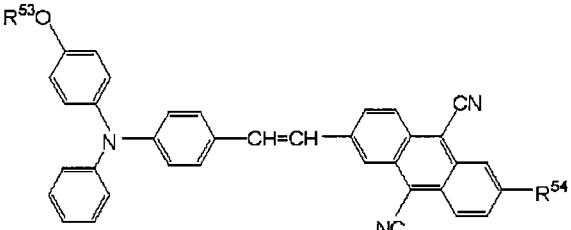
(但し、前記一般式(6)、(7)、(8)、(9)、(10)及び(11)において、R⁴⁴、R⁴⁵及びR⁴⁶は炭素数1以上の飽和若しくは不飽和の炭化水素基、又はフルオロアルキル基であり、R⁴⁷、R⁴⁸、R⁴⁹、R⁵⁰、R⁵¹及びR⁵²は互いに同一の若しくは異なる、炭素数1以上の飽和若しくは不飽和の炭化水素基、又はフルオロアルキル基であり、nは0～5の整数であり、mは0～3の整数であり、iは0～3の整数である。)、R⁴³は水素原子、炭素数1以上の飽和若しくは不飽和の炭化水素基、又は置換基を有してもよいアリール基である。)

【請求項3】 前記R⁴⁴、R⁴⁵、R⁴⁶、R⁴⁷、R⁴⁸、R⁴⁹、R⁵⁰、R⁵¹及びR⁵²の炭素数が1～6である、請求項2に記載したアミノスチリルアントラセン化合物。

【請求項4】 下記一般式(12)、(13)、(14)、(15)、(16)、(17)又は(18)で表わされる、請求項2に記載したアミノスチリルアントラセン化合物。

【化12】

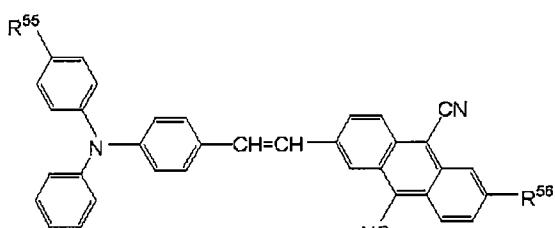
一般式(12) :



(但し、前記一般式(12)において、R⁵³は炭素数1～6の飽和若しくは不飽和の炭化水素基、又は置換基を有してもよいアリール基であり、R⁵⁴は水素原子、炭素数1～6の飽和若しくは不飽和の炭化水素基、又は置換基を有してもよいアリール基である。)

【化13】

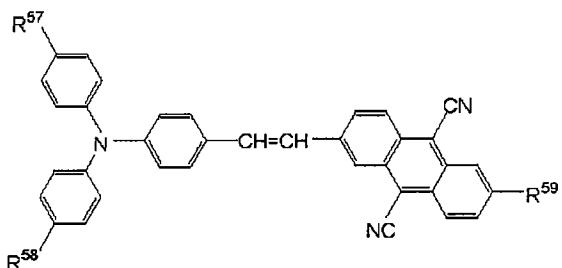
一般式(13) :



(但し、前記一般式(13)において、R⁵⁵は炭素数1～6の飽和若しくは不飽和の炭化水素基、トリフルオロメチル基、又は置換基を有してもよいアリール基であり、R⁵⁶は水素原子、炭素数1～6の飽和若しくは不飽和の炭化水素基、又は置換基を有してもよいアリール基である。)

【化14】

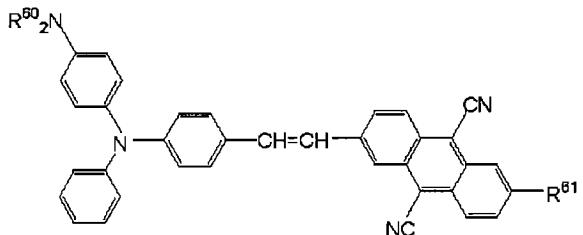
一般式(14) :



(但し、前記一般式(14)において、R⁵⁷及びR⁵⁸は炭素数1～6の飽和若しくは不飽和の炭化水素基、トリフルオロメチル基、又は置換基を有してもよいアリール基であり、R⁵⁹は水素原子、炭素数1～6の飽和若しくは不飽和の炭化水素基、又は置換基を有してもよいアリール基である。)

【化15】

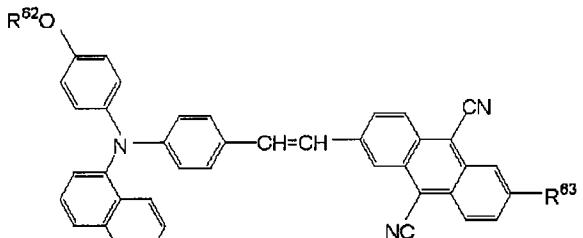
一般式(15) :



(但し、前記一般式(15)において、R⁶⁰は炭素数1～6の飽和若しくは不飽和の炭化水素基、又は置換基を有してもよいアリール基であり、R⁶¹は水素原子、炭素数1～6の飽和若しくは不飽和の炭化水素基、又は置換基を有してもよいアリール基である。)

【化16】

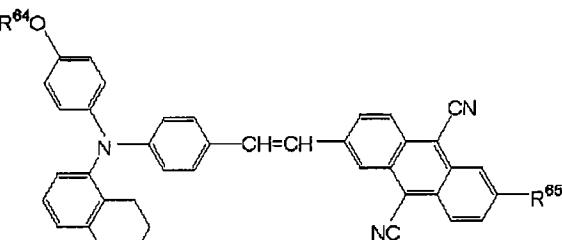
一般式(16) :



～6の飽和若しくは不飽和の炭化水素基、又は置換基を有してもよいアリール基であり、R⁶³は水素原子、炭素数1～6の飽和若しくは不飽和の炭化水素基、又は置換基を有してもよいアリール基である。)

【化17】

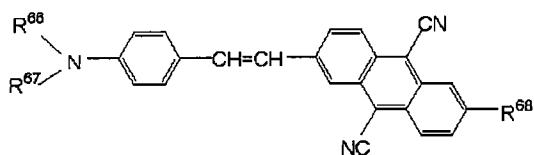
一般式(17) :



(但し、前記一般式(17)において、R⁶⁴は炭素数1～6の飽和若しくは不飽和の炭化水素基、又は置換基を有してもよいアリール基であり、R⁶⁵は水素原子、炭素数1～6の飽和若しくは不飽和の炭化水素基、又は置換基を有してもよいアリール基である。)

【化18】

一般式(18) :

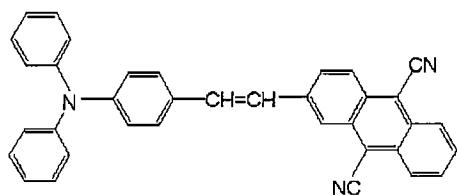


(但し、前記一般式(18)において、R⁶⁶及びR⁶⁷は炭素数1～6の飽和若しくは不飽和の炭化水素基、又は置換基を有してもよいアリール基であり、R⁶⁸は水素原子、炭素数1～6の飽和若しくは不飽和の炭化水素基、又は置換基を有してもよいアリール基である。)

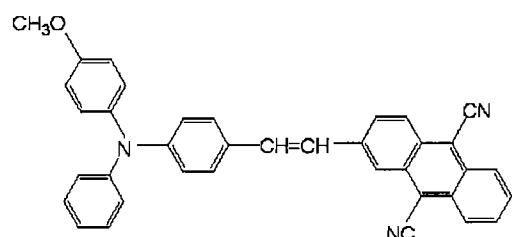
【請求項5】 下記構造式(19)－1、(19)－2、(19)－3、(19)－4、(19)－5、(19)－6、(19)－7、(19)－8、(19)－9、(19)－10、(19)－11又は(19)－12で表わされる、請求項2に記載したアミノスチリルアントラセン化合物。

【化19】

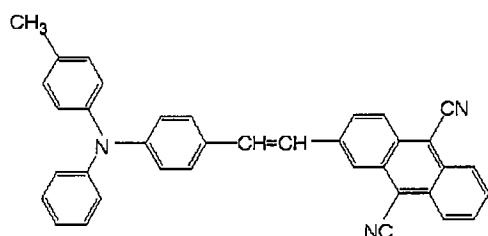
構造式(19)-1:



構造式(19)-2:

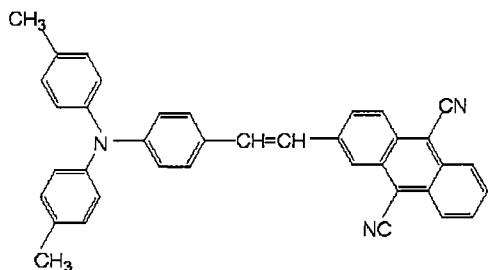


構造式(19)-3:

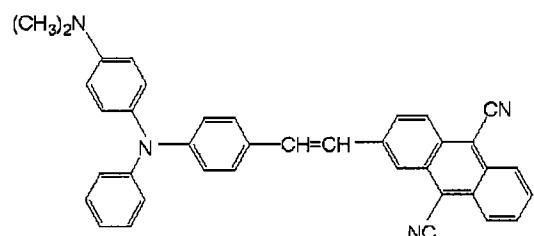


【化20】

構造式(19)-4:

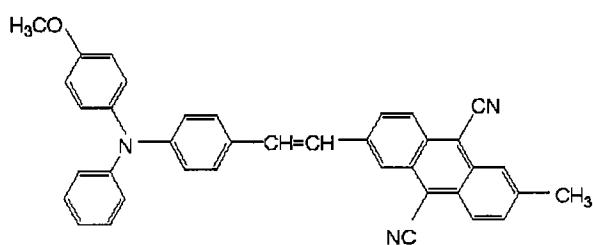


構造式(19)-5:

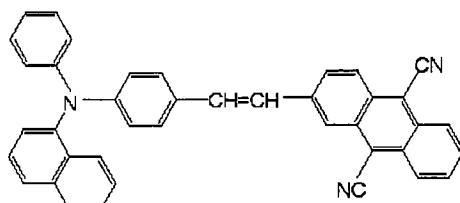


【化21】

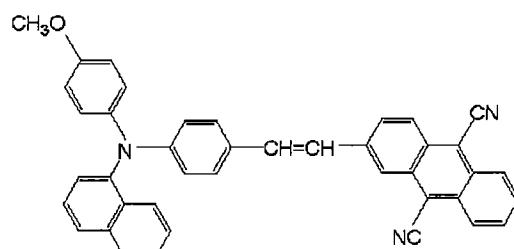
構造式(19)-6:



構造式(19)-7:

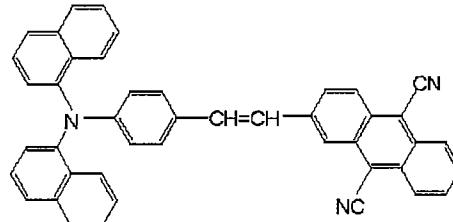


構造式(19)-8:

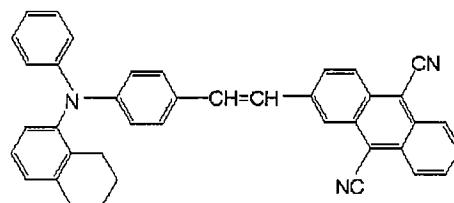


【化22】

構造式(19)-9:

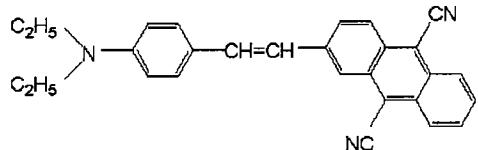


構造式(19)-10:

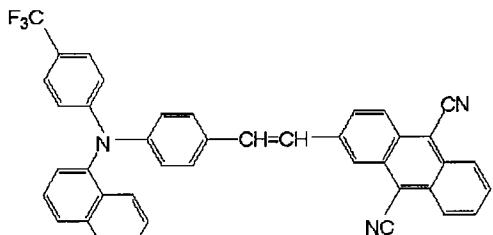


【化23】

構造式(19)-11:



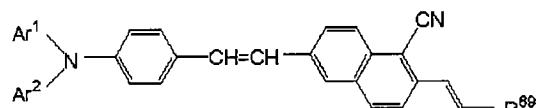
構造式(19)-12:



【請求項6】 下記一般式(20)で表わされる、請求項1に記載したアミノスチリルアントラセン化合物。

【化24】

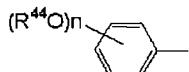
一般式(20):



(但し、前記一般式(20)において、Ar¹及びAr²はそれぞれ、置換基を有してもよい互いに同一の若しくは異なるアリール基であって、置換基を有する場合には下記一般式(6)、(7)、(8)、(9)、(10)及び(11)で表わされるアリール基から選ばれた基であり)

【化25】

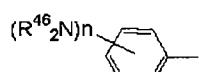
一般式(6):



一般式(7):

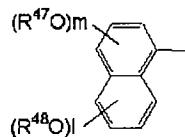


一般式(8):

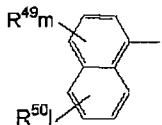


【化26】

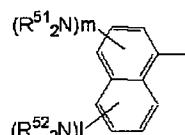
一般式(9):



一般式(10):



一般式(11):



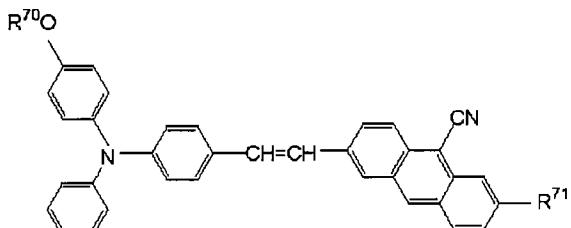
(但し、前記一般式(6)、(7)、(8)、(9)、(10)及び(11)において、R⁴⁴、R⁴⁵及びR⁴⁶は炭素数1以上の飽和若しくは不飽和の炭化水素基、又はフルオロアルキル基であり、R⁴⁷、R⁴⁸、R⁴⁹、R⁵₀、R⁵₁及びR⁵₂は互いに同一の若しくは異なる、炭素数1以上の飽和若しくは不飽和の炭化水素基、又はフルオロアルキル基であり、nは0～5の整数であり、mは0～3の整数であり、lは0～3の整数である。)、R⁶⁹は水素原子、炭素数1以上の飽和若しくは不飽和の炭化水素基、又は置換基を有してもよいアリール基である。)

【請求項7】 前記R⁴⁴、R⁴⁵、R⁴⁶、R⁴⁷、R⁴⁸、R⁴⁹、R⁵₀、R⁵₁及びR⁵₂の炭素数が1～6である、請求項6に記載したアミノスチリルアントラセン化合物。

【請求項8】 下記一般式(21)、(22)、(23)、(24)、(25)、(26)又は(27)で表わされる、請求項6に記載したアミノスチリルアントラセン化合物。

【化27】

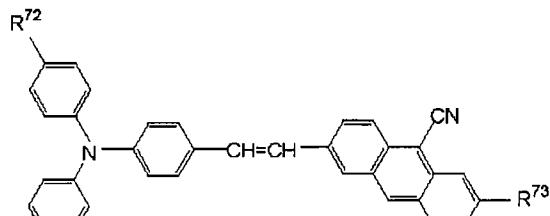
一般式(21):



(但し、前記一般式(21)において、R⁷₀は炭素数1～6の飽和若しくは不飽和の炭化水素基、又は置換基を有してもよいアリール基であり、R⁷₁は水素原子、炭素数1～6の飽和若しくは不飽和の炭化水素基、又は置換基を有してもよいアリール基である。)

【化28】

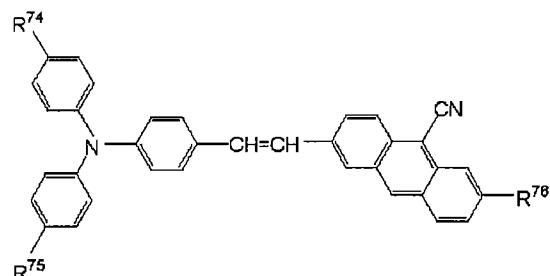
一般式(22)：



(但し、前記一般式(22)において、R72は炭素数1～6の飽和若しくは不飽和の炭化水素基、トリフルオロメチル基、又は置換基を有してもよいアリール基であり、R73は水素原子、炭素数1～6の飽和若しくは不飽和の炭化水素基、又は置換基を有してもよいアリール基である。)

【化29】

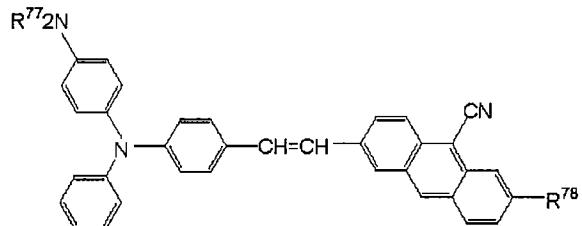
一般式(23)：



(但し、前記一般式(23)において、R74及びR75は炭素数1～6の飽和若しくは不飽和の炭化水素基、トリフルオロメチル基、又は置換基を有してもよいアリール基であり、R76は水素原子、炭素数1～6の飽和若しくは不飽和の炭化水素基、又は置換基を有してもよいアリール基である。)

【化30】

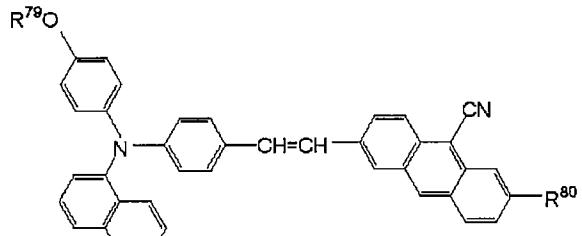
一般式(24)：



(但し、前記一般式(24)において、R77は炭素数1～6の飽和若しくは不飽和の炭化水素基、又は置換基を有してもよいアリール基であり、R78は水素原子、炭素数1～6の飽和若しくは不飽和の炭化水素基、又は置換基を有してもよいアリール基である。)

【化31】

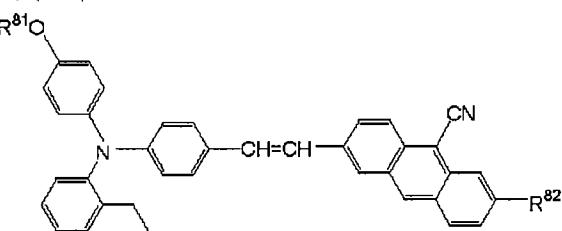
一般式(25)：



～6の飽和若しくは不飽和の炭化水素基、又は置換基を有してもよいアリール基であり、R80は水素原子、炭素数1～6の飽和若しくは不飽和の炭化水素基、又は置換基を有してもよいアリール基である。)

【化32】

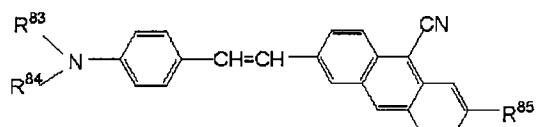
一般式(26)：



(但し、前記一般式(26)において、R81は炭素数1～6の飽和若しくは不飽和の炭化水素基、又は置換基を有してもよいアリール基であり、R82は水素原子、炭素数1～6の飽和若しくは不飽和の炭化水素基、又は置換基を有してもよいアリール基である。)

【化33】

一般式(27)：

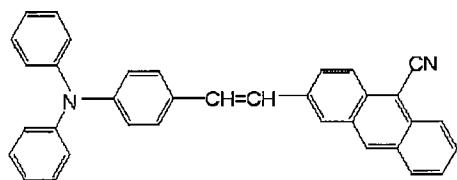


(但し、前記一般式(27)において、R83及びR84は炭素数1～6の飽和若しくは不飽和の炭化水素基、又は置換基を有してもよいアリール基であり、R85は水素原子、炭素数1～6の飽和若しくは不飽和の炭化水素基、又は置換基を有してもよいアリール基である。)

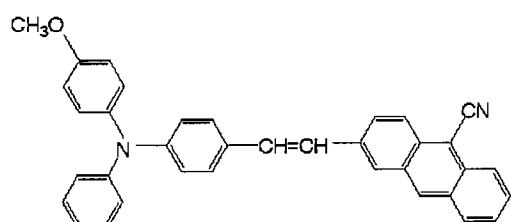
【請求項9】 下記構造式(28)-1、(28)-2、(28)-3、(28)-4、(28)-5、(28)-6、(28)-7、(28)-8、(28)-9、(28)-10、(28)-11又は(28)-12で表わされる、請求項6に記載したアミノスチリルアントラセン化合物。

【化34】

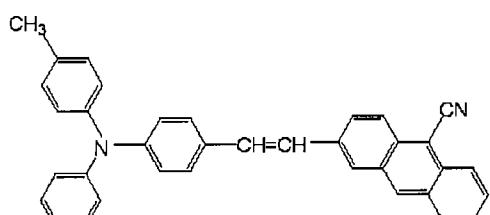
構造式 (28)-1:



構造式 (28)-2:

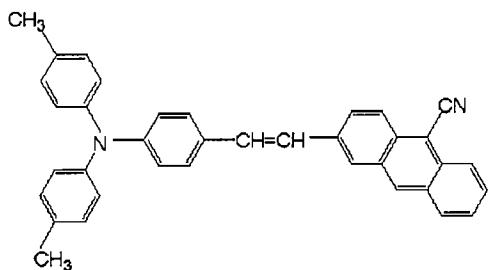


構造式 (28)-3:

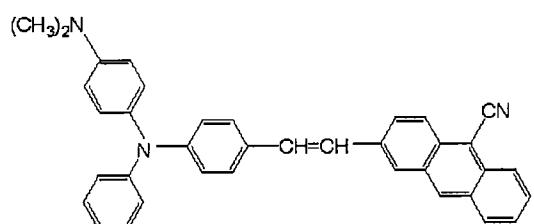


【化35】

構造式 (28)-4:

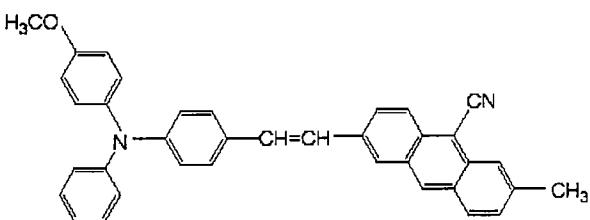


構造式 (28)-5:

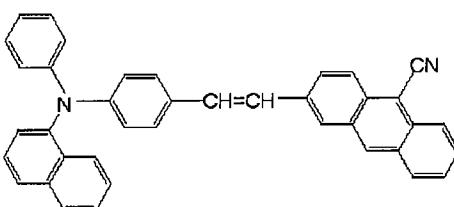


【化 3 6】

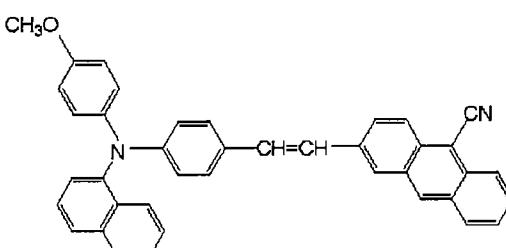
構造式 (28)-6:



構造式 (2.8) - 7

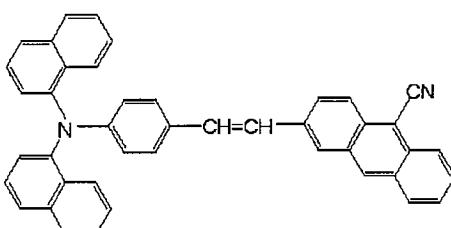


構造式(28)-8:

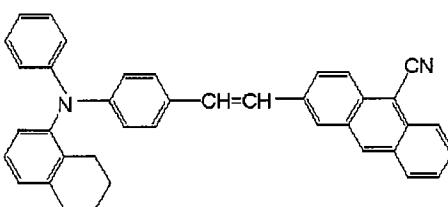


【化37】

構造式 (28)-9:

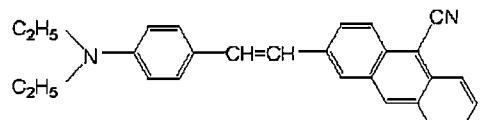


構造式 (28)-10:

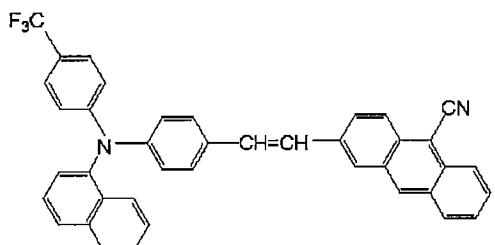


(化38)

構造式(28)-11:



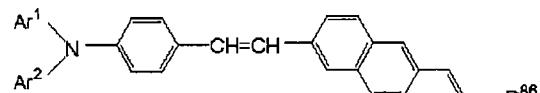
構造式(28)-12:



【請求項10】 下記一般式(29)で表わされる、請求項1に記載したアミノスチリルアントラセン化合物。

【化39】

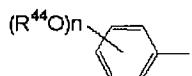
一般式(29):



(但し、前記一般式(29)において、Ar¹及びAr²はそれぞれ、置換基を有してもよい互いに同一の若しくは異なるアリール基であって、置換基を有する場合には下記一般式(6)、(7)、(8)、(9)、(10)及び(11)で表わされるアリール基から選ばれた基であり)

【化40】

一般式(6):



一般式(7):

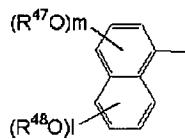


一般式(8):

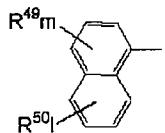


【化41】

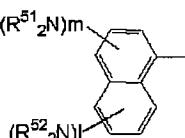
一般式(9):



一般式(10):



一般式(11):



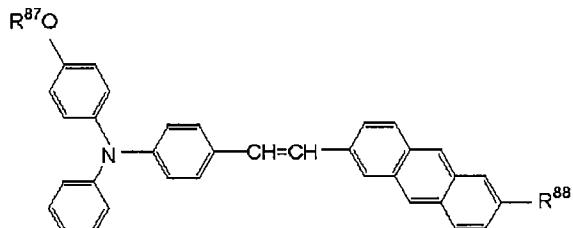
(但し、前記一般式(6)、(7)、(8)、(9)、(10)及び(11)において、R⁴⁴、R⁴⁵及びR⁴⁶は炭素数1以上の飽和若しくは不飽和の炭化水素基、又はフルオロアルキル基であり、R⁴⁷、R⁴⁸、R⁴⁹、R⁵⁰、R⁵¹及びR⁵²は互いに同一の又は異なる、炭素数1以上の飽和若しくは不飽和の炭化水素基、又はフルオロアルキル基であり、nは0～5の整数であり、mは0～3の整数であり、1は0～3の整数である。)、R⁸⁶は水素原子、炭素数1以上の飽和若しくは不飽和の炭化水素基、又は置換基を有してもよいアリール基である。)

【請求項11】 前記R⁴⁴、R⁴⁵、R⁴⁶、R⁴⁷、R⁴⁸、R⁴⁹、R⁵⁰、R⁵¹及びR⁵²の炭素数が1～6である、請求項10に記載したアミノスチリルアントラセン化合物。

【請求項12】 下記一般式(30)、(31)、(32)、(33)、(34)、(35)又は(36)で表わされる、請求項10に記載したアミノスチリルアントラセン化合物。

【化42】

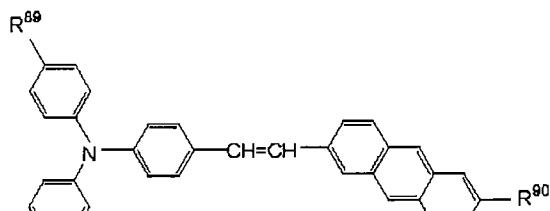
一般式(30):



(但し、前記一般式(30)において、R⁸⁷は炭素数1～6の飽和若しくは不飽和の炭化水素基、又は置換基を有してもよいアリール基であり、R⁸⁸は水素原子、炭素数1～6の飽和若しくは不飽和の炭化水素基、又は置換基を有してもよいアリール基である。)

【化43】

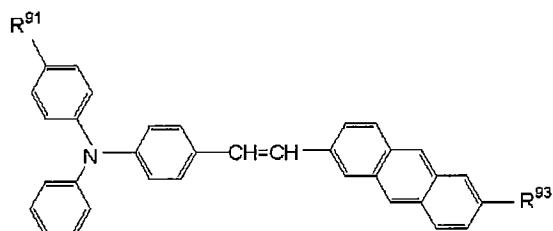
一般式(31)：



(但し、前記一般式(31)において、R⁸⁹は炭素数1～6の飽和若しくは不飽和の炭化水素基、トリフルオロメチル基、又は置換基を有してもよいアリール基であり、R⁹⁰は水素原子、炭素数1～6の飽和若しくは不飽和の炭化水素基、又は置換基を有してもよいアリール基である。)

【化44】

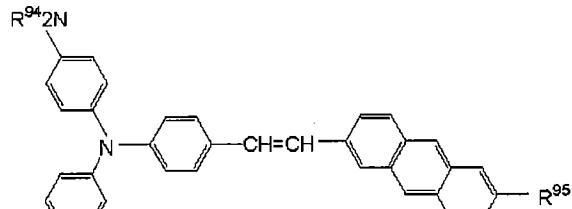
一般式(32)：



(但し、前記一般式(32)において、R⁹¹及びR⁹²は炭素数1～6の飽和若しくは不飽和の炭化水素基、トリフルオロメチル基、又は置換基を有してもよいアリール基であり、R⁹³は水素原子、炭素数1～6の飽和若しくは不飽和の炭化水素基、又は置換基を有してもよいアリール基である。)

【化45】

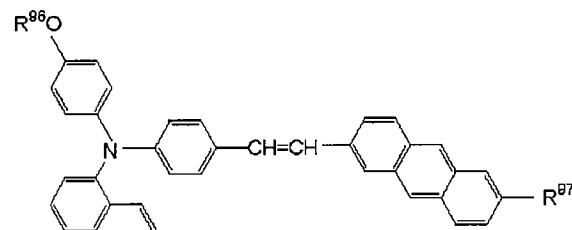
一般式(33)：



(但し、前記一般式(33)において、R⁹⁴は炭素数1～6の飽和若しくは不飽和の炭化水素基、又は置換基を有してもよいアリール基であり、R⁹⁵は水素原子、炭素数1～6の飽和若しくは不飽和の炭化水素基、又は置換基を有してもよいアリール基である。)

【化46】

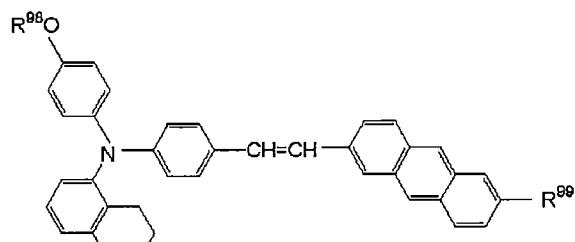
一般式(34)：



(但し、前記一般式(34)において、R⁹⁶は炭素数1～6の飽和若しくは不飽和の炭化水素基、又は置換基を有してもよいアリール基であり、R⁹⁷は水素原子、炭素数1～6の飽和若しくは不飽和の炭化水素基、又は置換基を有してもよいアリール基である。)

【化47】

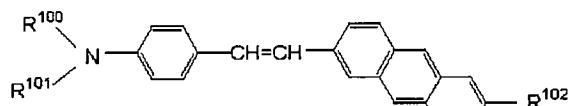
一般式(35)：



(但し、前記一般式(35)において、R⁹⁸は炭素数1～6の飽和若しくは不飽和の炭化水素基、又は置換基を有してもよいアリール基であり、R⁹⁹は水素原子、炭素数1～6の飽和若しくは不飽和の炭化水素基、又は置換基を有してもよいアリール基である。)

【化48】

一般式(36)：

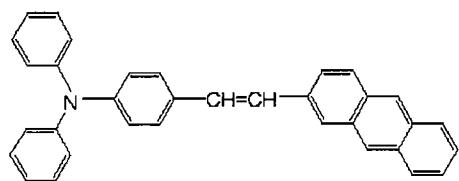


(但し、前記一般式(36)において、R¹⁰⁰及びR¹⁰¹は炭素数1～6の飽和若しくは不飽和の炭化水素基、又は置換基を有してもよいアリール基であり、R¹⁰²は水素原子、炭素数1～6の飽和若しくは不飽和の炭化水素基、又は置換基を有してもよいアリール基である。)

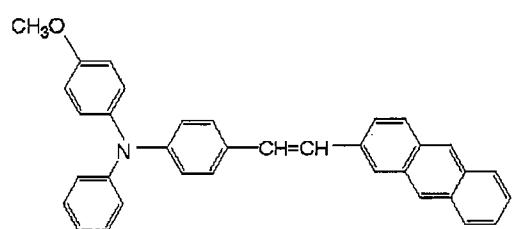
【請求項13】 下記構造式(37)-1、(37)-2、(37)-3、(37)-4、(37)-5、(37)-6、(37)-7、(37)-8、(37)-9、(37)-10、(37)-11又は(37)-12で表わされる、請求項10に記載したアミノスチリルアントラセン化合物。

【化49】

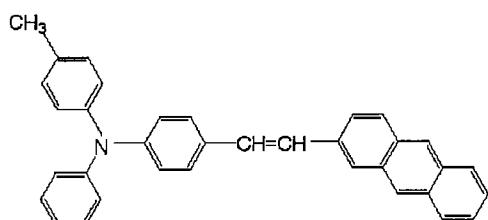
構造式(37)-1:



構造式(37)-2:

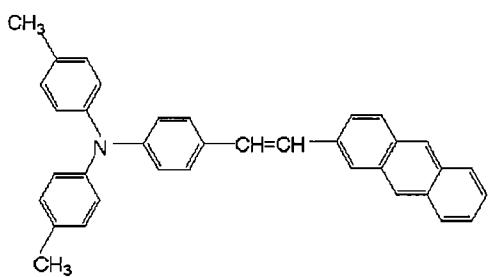


構造式(37)-3:

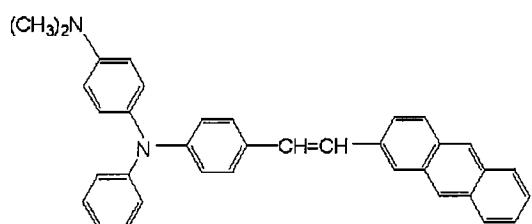


【化50】

構造式(37)-4:

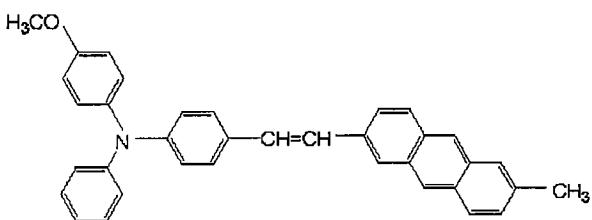


構造式(37)-5:

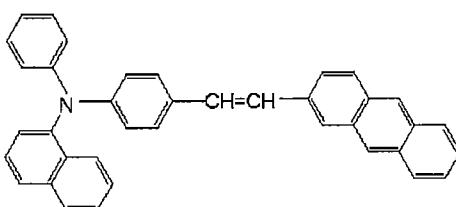


【化51】

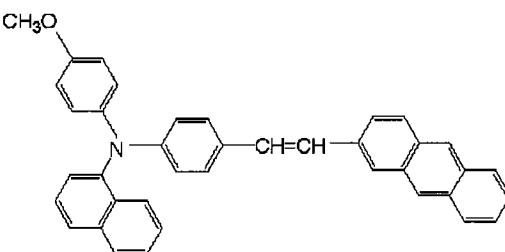
構造式(37)-6:



構造式(37)-7:

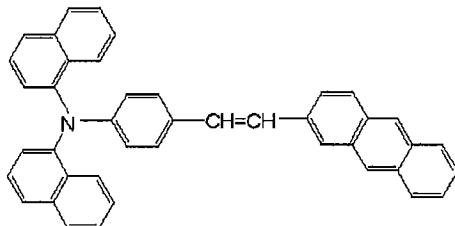


構造式(37)-8:

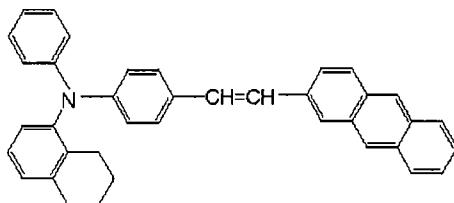


【化52】

構造式(37)-9:

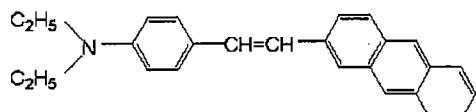


構造式(37)-10:

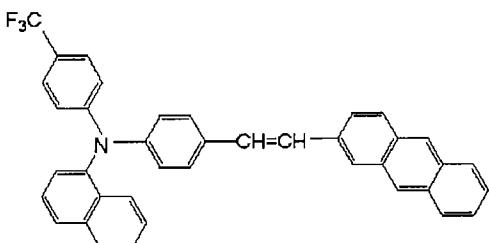


【化53】

構造式 (37) - 11 :



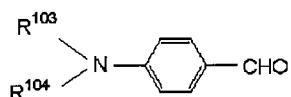
構造式 (37) - 12 :



【請求項 14】 下記一般式 [V] で表わされるアミノベンズアルデヒドと；下記一般式 [VI] で表わされるホスホン酸エステル又は下記一般式 [VII] で表わされるホスホニウム塩と；を縮合させることによって、下記一般式 [I] 、 [II] 、 [III] 又は [IV] で表わされるアミノスチリルアントラセン化合物を得る、アミノスチリルアントラセン化合物の製造方法。

【化 54】

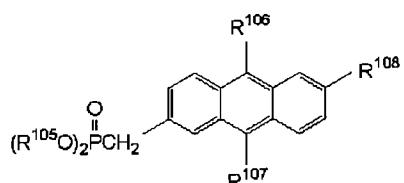
一般式 [V] :



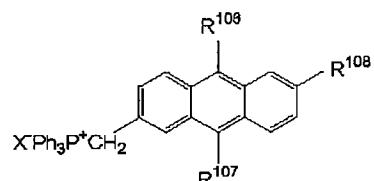
(但し、前記一般式 [V] において、R¹⁰³及びR¹⁰⁴はそれぞれ、下記R¹、R²、R¹¹、R¹²、R²¹、R²²、R³⁸又はR³⁹に相当する基である。)

【化 55】

一般式 [VI] :



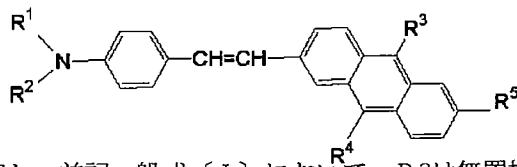
一般式 [VII] :



(但し、前記一般式 [VI] 及び [VII] において、R¹⁰⁵は炭化水素基であり、R¹⁰⁶及びR¹⁰⁷はそれぞれ、下記R³、R⁴、R¹³、R¹⁴、R²³、R²⁴、R⁴⁰又はR⁴¹に相当する基であり、R¹⁰⁸は下記R⁵、R¹⁶、R²⁵又はR⁴²に相当する基であり、Xはハロゲン原子である。)

【化 56】

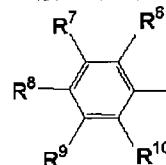
一般式 [I] :



[但し、前記一般式 [I] において、R²は無置換のアリール基であり、R¹は下記一般式 (1) で表わされるアリール基であり、

【化 57】

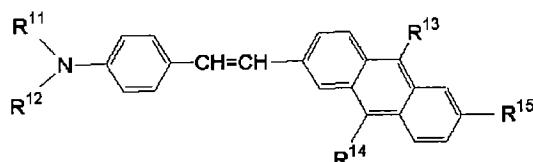
一般式 (1) :



(但し、前記一般式 (1) において、R⁶、R⁷、R⁸、R⁹及びR¹⁰は互いに同一の若しくは異なる基であつて、水素原子、炭素数 1 以上の飽和若しくは不飽和の炭化水素オキシ基、炭化水素基、炭化水素アミノ基、フルオロアルキル基、又は置換基を有してもよいアリール基である。)、R³及びR⁴は互いに同一の若しくは異なる基であつて、それらの少なくとも 1 つが水素原子、シアノ基、フルオロアルキル基、ニトロ基又はハロゲン原子であり、R⁵は水素原子、炭素数 1 以上の飽和若しくは不飽和の炭化水素基、又は置換基を有してもよいアリール基である。)

【化 58】

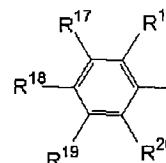
一般式 (II) :



[但し、前記一般式 (II) において、R¹¹及びR¹²は互いに同一の若しくは異なる基であつて、下記一般式 (2) で表わされるアリール基であり、

【化 59】

一般式 (2) :

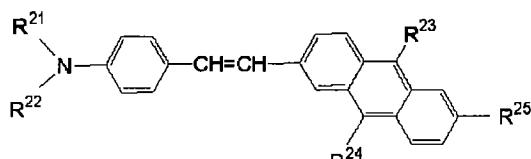


(但し、前記一般式 (2) において、R¹⁶、R¹⁷、R¹⁸、R¹⁹及びR²⁰は互いに同一の若しくは異なる基であつて、水素原子、炭素数 1 以上の飽和若しくは不飽和の炭化水素オキシ基、炭化水素基、炭化水素アミノ基、フルオロアルキル基、又は置換基を有してもよいアリール基である。)、R¹³及びR¹⁴は互いに同一の若しくは異なる基であつて、それらの少なくとも 1 つが水素原

ゲン原子であり、R¹⁵は水素原子、炭素数1以上の飽和若しくは不飽和の炭化水素基、又は置換基を有してもよいアリール基である。】

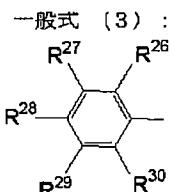
【化6 0】

一般式 [III] :



(但し、前記一般式 [III]において、R²¹は下記一般式(3)で表わされるアリール基であり、

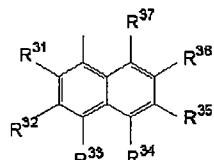
【化6 1】



(但し、前記一般式 (3)において、R²⁶、R²⁷、R²⁸、R²⁹及びR³⁰は互いに同一の若しくは異なる基であって、水素原子、炭素数1以上の飽和若しくは不飽和の炭化水素オキシ基、炭化水素基、炭化水素アミノ基又はフルオロアルキル基である。)、R²²は下記一般式(4)で表わされるアリール基であり、

【化6 2】

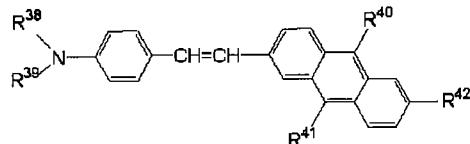
一般式 (4) :



(但し、前記一般式 (4)において、R³¹、R³²、R³³、R³⁴、R³⁵、R³⁶及びR³⁷は互いに同一の若しくは異なる基であって、水素原子、炭素数1以上の飽和若しくは不飽和の炭化水素オキシ基、炭化水素基、炭化水素アミノ基、フルオロアルキル基、又は置換基を有してもよいアリール基である。)、R²³及びR²⁴は互いに同一の若しくは異なる基であって、それらの少なくとも1つが水素原子、シアノ基、フルオロアルキル基、ニトロ基又はハロゲン原子であり、R²⁵は水素原子、炭素数1以上の飽和若しくは不飽和の炭化水素基、又は置換基を有してもよいアリール基である。)

【化6 3】

一般式 [IV] :



(但し、前記一般式 [IV]において、R³⁸及びR³⁹は互いに同一の若しくは異なる基であって、水素原子、炭素

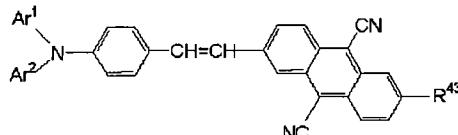
る。)、R⁴⁰及びR⁴¹は互いに同一の若しくは異なる基であって、それらの少なくとも1つが水素原子、シアノ基、フルオロアルキル基、ニトロ基又はハロゲン原子であり、R⁴²は水素原子、炭素数1以上の飽和若しくは不飽和の炭化水素基、又は置換基を有してもよいアリール基である。】

【請求項1 5】 前記縮合をウイッティヒーホーナー(Wittig-Horner)反応又はウイッティヒ(Wittig)反応によって行い、前記ホスホン酸エステル及び／又は前記ホスホニウム塩を溶媒中で塩基で処理することによってカルボアニオンを生成させ、このカルボアニオンと前記アミノベンズアルデヒドとを縮合させる、請求項1 4に記載したアミノスチリルアントラセン化合物の製造方法。

【請求項1 6】 下記一般式(5)で表わされるアミノスチリルアントラセン化合物を得るに際し

【化6 4】

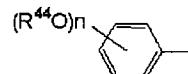
一般式 (5) :



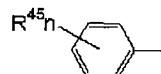
(但し、前記一般式 (5)において、Ar¹及びAr²はそれぞれ、置換基を有してもよい互いに同一の若しくは異なるアリール基であって、置換基を有する場合には下記一般式(6)、(7)、(8)、(9)、(10)及び(11)で表わされるアリール基から選ばれた基であり、

【化6 5】

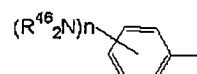
一般式 (6) :



一般式 (7) :

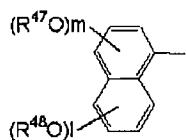


一般式 (8) :

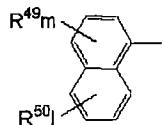


【化6 6】

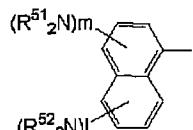
一般式(9) :



一般式(10) :



一般式(11) :

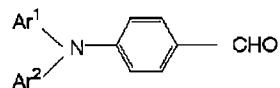


(但し、前記一般式(6)、(7)、(8)、(9)、(10)及び(11)において、R⁴⁴、R⁴⁵及びR⁴⁶は炭素数1以上の飽和若しくは不飽和の炭化水素基、又はフルオロアルキル基であり、R⁴⁷、R⁴⁸、R⁴⁹、R⁵⁰、R⁵¹及びR⁵²は互いに同一の若しくは異なる、炭素数1以上の飽和若しくは不飽和の炭化水素基、又はフルオロアルキル基であり、nは0～5の整数であり、mは0～3の整数であり、lは0～3の整数である。)、R⁴³は水素原子、炭素数1以上の飽和若しくは不飽和の炭化水素基、又は置換基を有してもよいアリール基である。)、

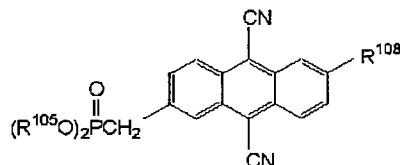
下記一般式(38)で表わされる4-(N,N-ジアリールアミノ)ベンズアルデヒドと；下記一般式(39)で表わされるホスホン酸エステル又は下記一般式(40)で表わされるホスホニウム塩と；を縮合させる、請求項14に記載したアミノスチリルアントラセン化合物の製造方法。

【化67】

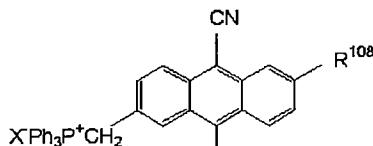
一般式(38) :



一般式(39) :



一般式(40) :



(但し、前記一般式(38)、(39)および(40)において、Ar¹、Ar²、R¹⁰⁵及びXは前記したものと同じである。)

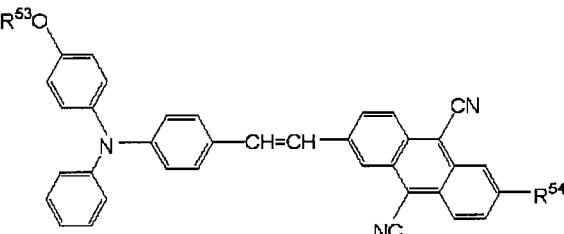
【請求項17】 前記R¹⁰⁵を炭素数1～4の飽和炭化水素基とする、請求項14に記載したアミノスチリルアントラセン化合物の製造方法。

【請求項18】 前記R⁴⁴、R⁴⁵、R⁴⁶、R⁴⁷、R⁴⁸、R⁴⁹、R⁵⁰、R⁵¹及びR⁵²の炭素数を1～6とする、請求項16に記載したアミノスチリルアントラセン化合物の製造方法。

【請求項19】 下記一般式(12)、(13)、(14)、(15)、(16)、(17)又は(18)で表わされるアミノスチリルアントラセン化合物を得る、請求項16に記載したアミノスチリルアントラセン化合物の製造方法。

【化68】

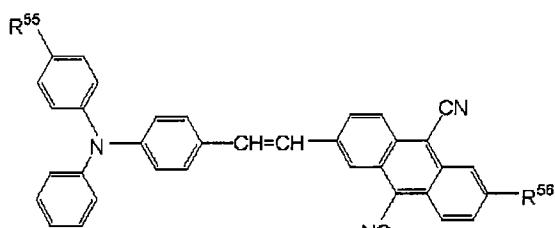
一般式(12) :



(但し、前記一般式(12)において、R⁵³は炭素数1～6の飽和若しくは不飽和の炭化水素基、又は置換基を有してもよいアリール基であり、R⁵⁴は水素原子、炭素数1～6の飽和若しくは不飽和の炭化水素基、又は置換基を有してもよいアリール基である。)

【化69】

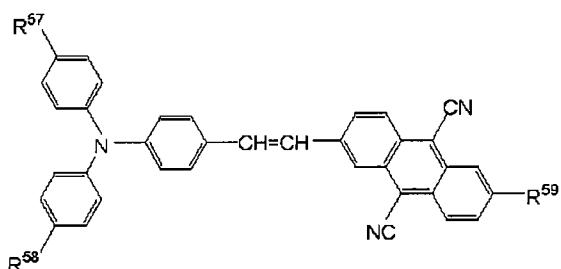
一般式(13)：



(但し、前記一般式(13)において、R⁵⁵は炭素数1～6の飽和若しくは不飽和の炭化水素基、トリフルオロメチル基、又は置換基を有してもよいアリール基であり、R⁵⁶は水素原子、炭素数1～6の飽和若しくは不飽和の炭化水素基、又は置換基を有してもよいアリール基である。)

【化70】

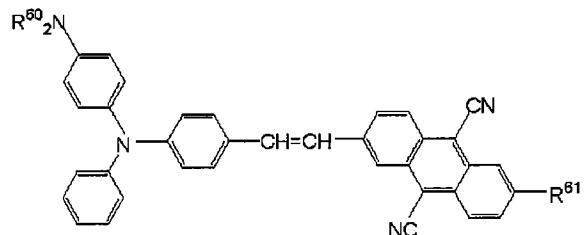
一般式(14)：



(但し、前記一般式(14)において、R⁵⁷及びR⁵⁸は炭素数1～6の飽和若しくは不飽和の炭化水素基、トリフルオロメチル基、又は置換基を有してもよいアリール基であり、R⁵⁹は水素原子、炭素数1～6の飽和若しくは不飽和の炭化水素基、又は置換基を有してもよいアリール基である。)

【化71】

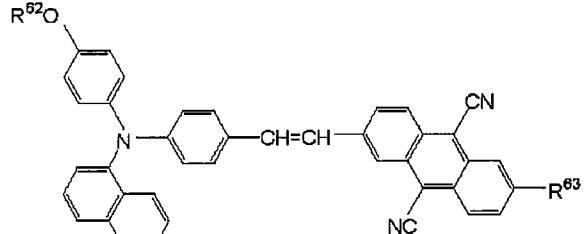
一般式(15)：



(但し、前記一般式(15)において、R⁶⁰は炭素数1～6の飽和若しくは不飽和の炭化水素基、又は置換基を有してもよいアリール基であり、R⁶¹は水素原子、炭素数1～6の飽和若しくは不飽和の炭化水素基、又は置換基を有してもよいアリール基である。)

【化72】

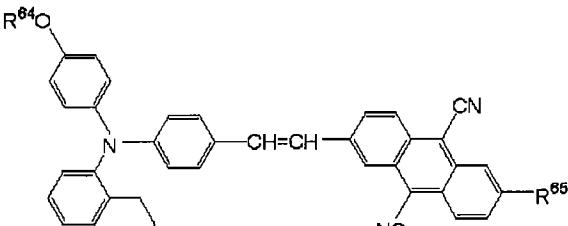
一般式(16)：



～6の飽和若しくは不飽和の炭化水素基、又は置換基を有してもよいアリール基であり、R⁶³は水素原子、炭素数1～6の飽和若しくは不飽和の炭化水素基、又は置換基を有してもよいアリール基である。)

【化73】

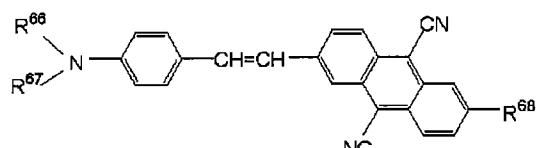
一般式(17)：



(但し、前記一般式(17)において、R⁶⁴は炭素数1～6の飽和若しくは不飽和の炭化水素基、又は置換基を有してもよいアリール基であり、R⁶⁵は水素原子、炭素数1～6の飽和若しくは不飽和の炭化水素基、又は置換基を有してもよいアリール基である。)

【化74】

一般式(18)：

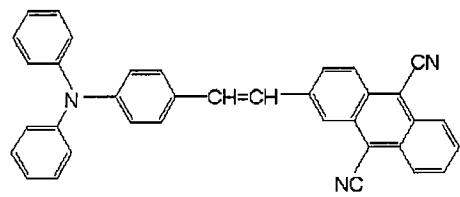


(但し、前記一般式(18)において、R⁶⁶及びR⁶⁷は炭素数1～6の飽和若しくは不飽和の炭化水素基、又は置換基を有してもよいアリール基であり、R⁶⁸は水素原子、炭素数1～6の飽和若しくは不飽和の炭化水素基、又は置換基を有してもよいアリール基である。)

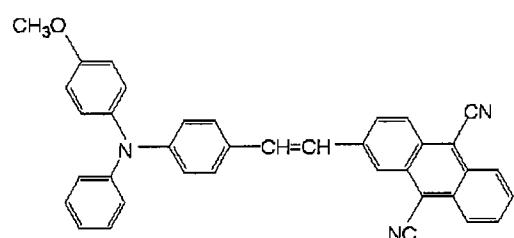
【請求項20】 下記構造式(19)－1、(19)－2、(19)－3、(19)－4、(19)－5、(19)－6、(19)－7、(19)－8、(19)－9、(19)－10、(19)－11又は(19)－12で表わされるアミノスチリルアントラセン化合物を得る、請求項16に記載したアミノスチリルアントラセン化合物の製造方法。

【化75】

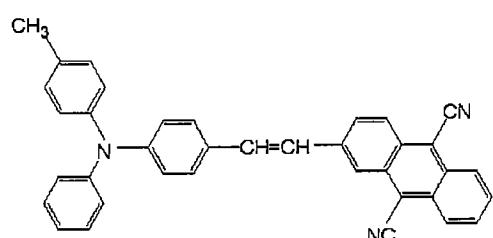
構造式 (19) - 1 :



構造式 (19) - 2 :

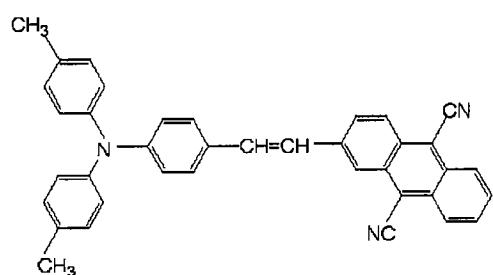


構造式 (19) - 3 :

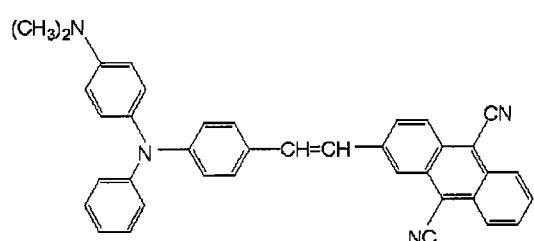


【化76】

構造式 (19) - 4 :

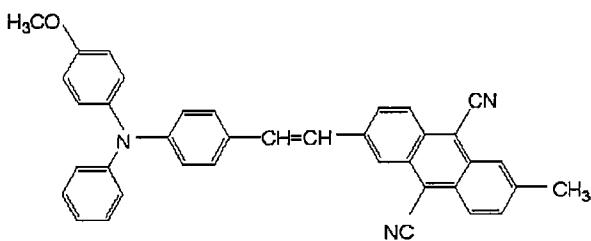


構造式 (19) - 5 :

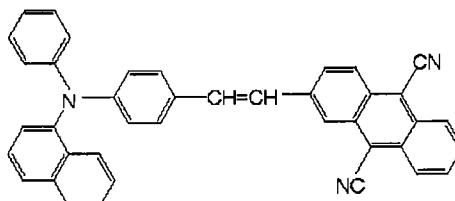


【化77】

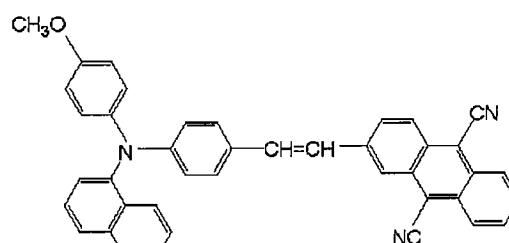
構造式 (19) - 6 :



構造式 (19) - 7 :

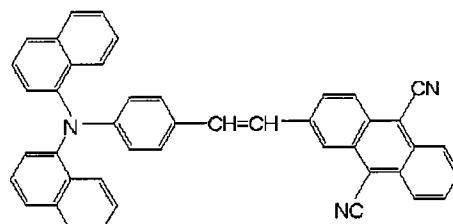


構造式 (19) - 8 :

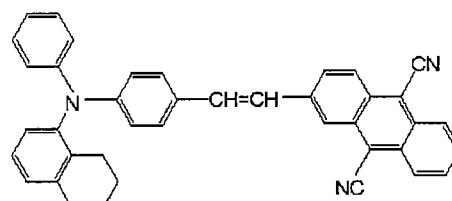


【化78】

構造式 (19) - 9 :

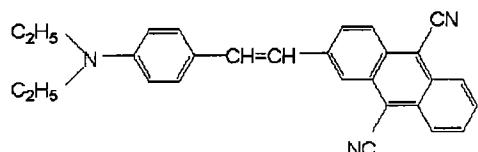


構造式 (19) - 10 :

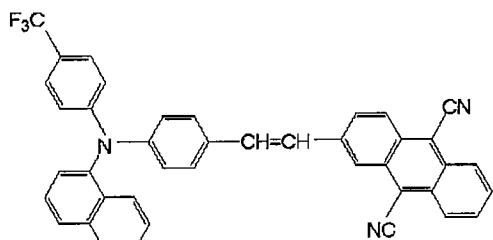


【化79】

構造式(19)-11:



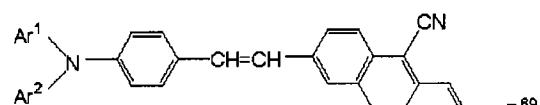
構造式(19)-12:



【請求項21】 下記一般式(20)で表わされるアミノスチリルアントラセン化合物を得るに際し

【化80】

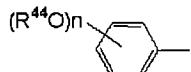
一般式(20):



(但し、前記一般式(20)において、Ar¹及びAr²はそれぞれ、置換基を有してもよい互いに同一の又は異なるアリール基であって、置換基を有する場合には下記一般式(6)、(7)、(8)、(9)、(10)及び(11)で表わされるアリール基から選ばれた基であり

【化81】

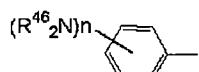
一般式(6):



一般式(7):

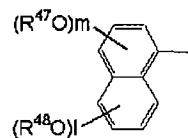


一般式(8):

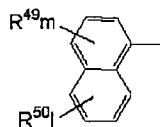


【化82】

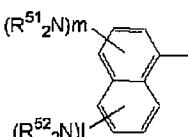
一般式(9):



一般式(10):



一般式(11):

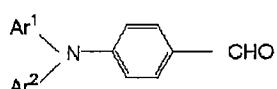


(但し、前記一般式(6)、(7)、(8)、(9)、(10)及び(11)において、R⁴⁴、R⁴⁵及びR⁴⁶は炭素数1以上の飽和若しくは不飽和の炭化水素基、又はフルオロアルキル基であり、R⁴⁷、R⁴⁸、R⁴⁹、R⁵⁰、R⁵¹及びR⁵²は互いに同一の若しくは異なる、炭素数1以上の飽和若しくは不飽和の炭化水素基、又はフルオロアルキル基であり、nは0～5の整数であり、mは0～3の整数であり、lは0～3の整数である。)、R⁶⁹は水素原子、炭素数1以上の飽和若しくは不飽和の炭化水素基、又は置換基を有してもよいアリール基である。)

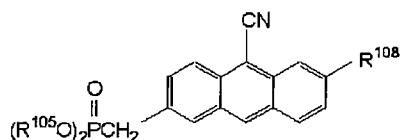
下記一般式(38)で表わされる4-(N,N-ジアリールアミノ)ベンズアルデヒドと；下記一般式(41)で表わされるホスホン酸エステル又は下記一般式(42)で表わされるホスホニウム塩と；を縮合させる、請求項14に記載したアミノスチリルアントラセン化合物の製造方法。

【化83】

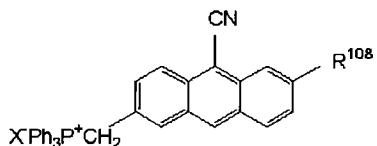
一般式(38) :



一般式(41) :



一般式(42) :



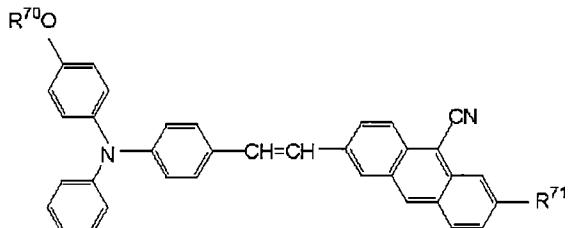
(但し、前記一般式(38)、(41)及び(42)において、Ar¹、Ar²、R¹⁰⁵及びXは前記したものと同じである。)

【請求項22】 前記R⁴⁴、R⁴⁵、R⁴⁶、R⁴⁷、R⁴⁸、R⁴⁹、R⁵⁰、R⁵¹及びR⁵²の炭素数を1～6とする、請求項21に記載したアミノスチリルアントラセン化合物の製造方法。

【請求項23】 下記一般式(21)、(22)、(23)、(24)、(25)、(26)又は(27)で表わされるアミノスチリルアントラセン化合物を得る、請求項21に記載したアミノスチリルアントラセン化合物の製造方法。

【化84】

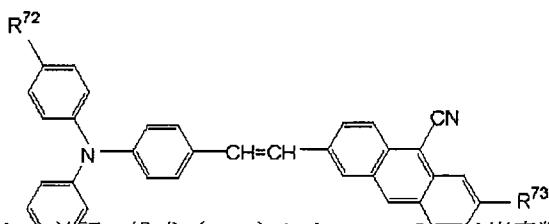
一般式(21) :



(但し、前記一般式(21)において、R⁷⁰は炭素数1～6の飽和若しくは不飽和の炭化水素基、又は置換基を有してもよいアリール基であり、R⁷¹は水素原子、炭素数1～6の飽和若しくは不飽和の炭化水素基、又は置換基を有してもよいアリール基である。)

【化85】

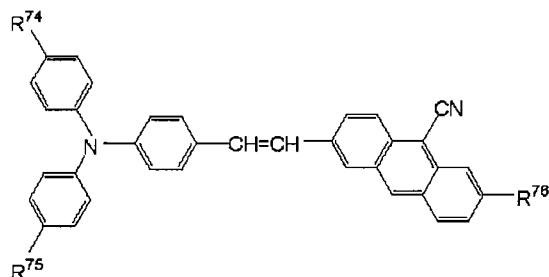
一般式(22) :



(但し、前記一般式(22)において、R⁷²は炭素数1～6の飽和若しくは不飽和の炭化水素基、トリフルオロメチル基、又は置換基を有してもよいアリール基であり、R⁷³は水素原子、炭素数1～6の飽和若しくは不飽和の炭化水素基、又は置換基を有してもよいアリール基である。)

【化86】

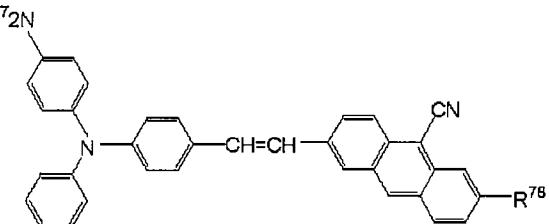
一般式(23) :



(但し、前記一般式(23)において、R⁷⁴及びR⁷⁵は炭素数1～6の飽和若しくは不飽和の炭化水素基、トリフルオロメチル基、又は置換基を有してもよいアリール基であり、R⁷⁶は水素原子、炭素数1～6の飽和若しくは不飽和の炭化水素基、又は置換基を有してもよいアリール基である。)

【化87】

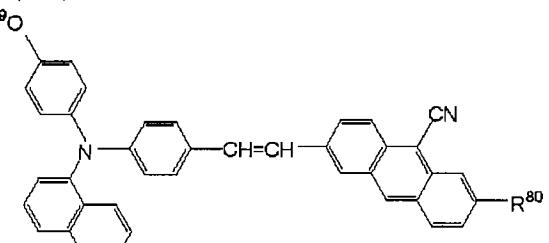
一般式(24) :



(但し、前記一般式(24)において、R⁷⁷は炭素数1～6の飽和若しくは不飽和の炭化水素基、又は置換基を有してもよいアリール基であり、R⁷⁸は水素原子、炭素数1～6の飽和若しくは不飽和の炭化水素基、又は置換基を有してもよいアリール基である。)

【化88】

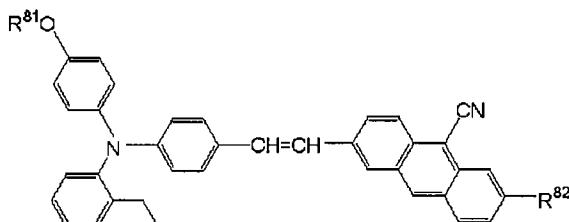
一般式(25) :



～6の飽和若しくは不飽和の炭化水素基、又は置換基を有してもよいアリール基であり、R⁸⁰は水素原子、炭素数1～6の飽和若しくは不飽和の炭化水素基、又は置換基を有してもよいアリール基である。)

【化89】

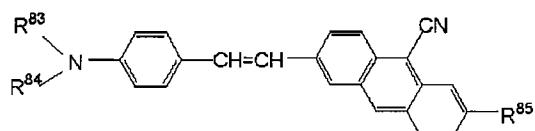
一般式(26)：



(但し、前記一般式(26)において、R⁸¹は炭素数1～6の飽和若しくは不飽和の炭化水素基、又は置換基を有してもよいアリール基であり、R⁸²は水素原子、炭素数1～6の飽和若しくは不飽和の炭化水素基、又は置換基を有してもよいアリール基である。)

【化90】

一般式(27)：

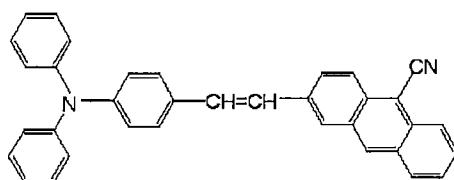


(但し、前記一般式(27)において、R⁸³及びR⁸⁴は炭素数1～6の飽和若しくは不飽和の炭化水素基、又は置換基を有してもよいアリール基であり、R⁸⁵は水素原子、炭素数1～6の飽和若しくは不飽和の炭化水素基、又は置換基を有してもよいアリール基である。)

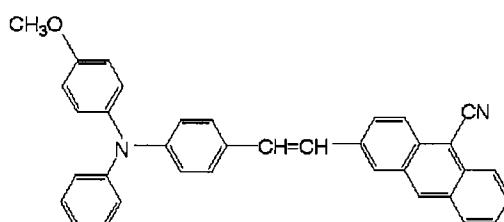
【請求項24】 下記構造式(28)-1、(28)-2、(28)-3、(28)-4、(28)-5、(28)-6、(28)-7、(28)-8、(28)-9、(28)-10、(28)-11又は(28)-12で表わされるアミノスチリルアントラセン化合物を得る、請求項21に記載したアミノスチリルアントラセン化合物の製造方法。

【化91】

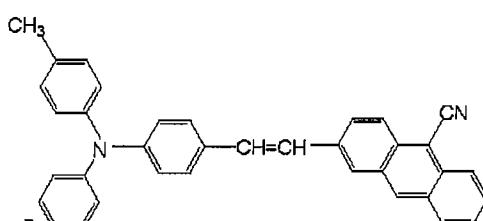
構造式(28)-1：



構造式(28)-2：

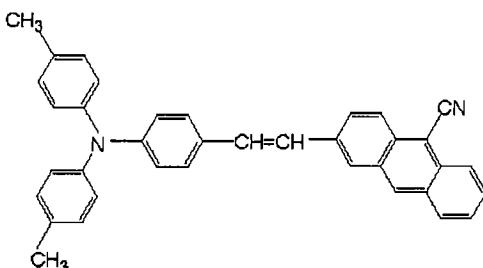


構造式(28)-3：

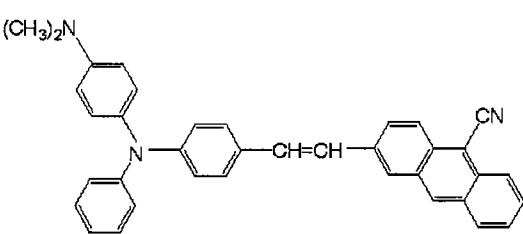


【化92】

構造式(28)-4：

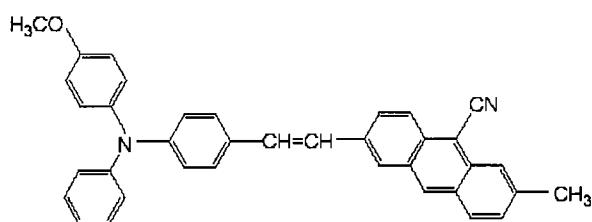


構造式(28)-5：

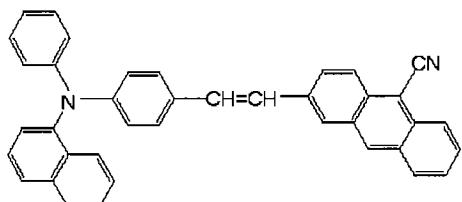


【化93】

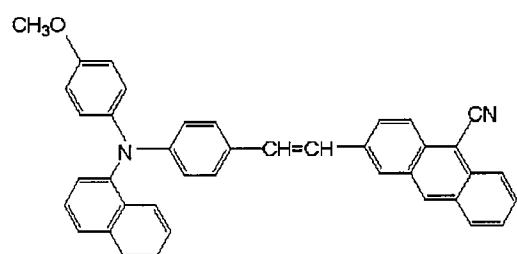
構造式(28)-6:



構造式(28)-7:

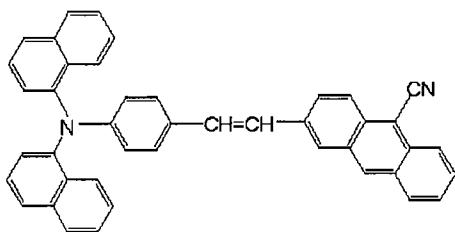


構造式(28)-8:

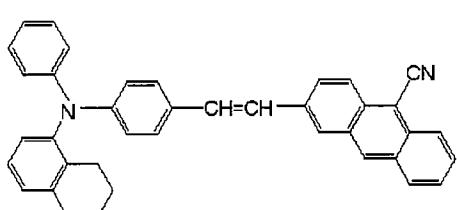


【化94】

構造式(28)-9:

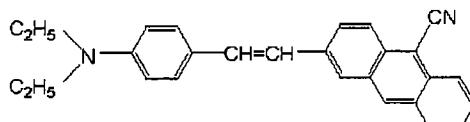


構造式(28)-10:

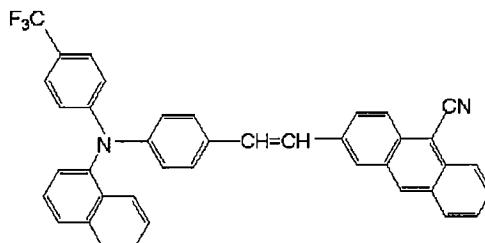


【化95】

構造式(28)-11:



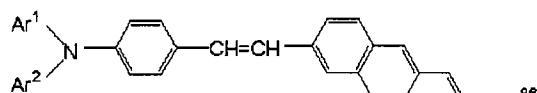
構造式(28)-12:



【請求項25】 下記一般式(29)で表わされるアミノスチリルアントラセン化合物を得るに際し

【化96】

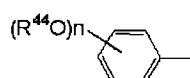
一般式(29):



(但し、前記一般式(29)において、 Ar^1 及び Ar^2 はそれぞれ、置換基を有してもよい互いに同一の若しくは異なるアリール基であって、置換基を有する場合には下記一般式(6)、(7)、(8)、(9)、(10)及び(11)で表わされるアリール基から選ばれた基であり

【化97】

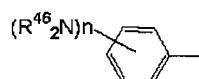
一般式(6):



一般式(7):

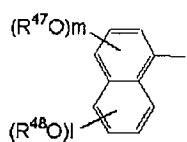


一般式(8):

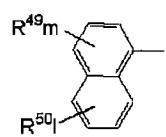


【化98】

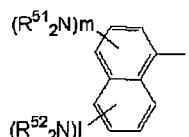
一般式(9) :



一般式(10) :



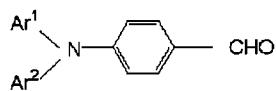
一般式(11) :



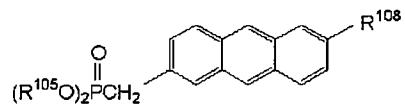
(但し、前記一般式(6)、(7)、(8)、(9)、(10)及び(11)において、R⁴⁴、R⁴⁵及びR⁴⁶は炭素数1以上の飽和若しくは不飽和の炭化水素基、又はフルオロアルキル基であり、R⁴⁷、R⁴⁸、R⁴⁹、R⁵⁰、R⁵¹及びR⁵²は互いに同一の又は異なる、炭素数1以上の飽和若しくは不飽和の炭化水素基、又はフルオロアルキル基であり、nは0～5の整数であり、mは0～3の整数であり、Iは0～3の整数である。)、R⁸⁶は水素原子、炭素数1以上の飽和若しくは不飽和の炭化水素基、又は置換基を有してもよいアリール基である。]、下記一般式(38)で表わされる4-(N,N-ジアリールアミノ)ベンズアルデヒドと；下記一般式(43)で表わされるホスホン酸エステル又は下記一般式(44)で表わされるホスホニウム塩と；を縮合させる、請求項14に記載したアミノスチリルアントラセン化合物の製造方法。

【化99】

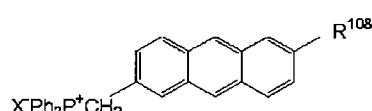
一般式(38) :



一般式(43) :



一般式(44) :



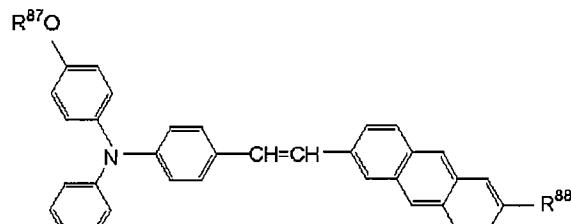
いて、A^{r1}、A^{r2}、R¹⁰⁵及びXは前記したものと同じである。)

【請求項26】 前記R⁴⁴、R⁴⁵、R⁴⁶、R⁴⁷、R⁴⁸、R⁴⁹、R⁵⁰、R⁵¹及びR⁵²の炭素数を1～6とする、請求項25に記載したアミノスチリルアントラセン化合物の製造方法。

【請求項27】 下記一般式(30)、(31)、(32)、(33)、(34)、(35)又は(36)で表わされるアミノスチリルアントラセン化合物を得る、請求項25に記載したアミノスチリルアントラセン化合物の製造方法。

【化100】

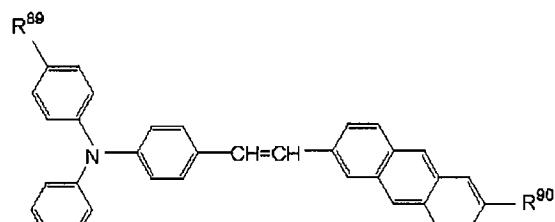
一般式(30) :



(但し、前記一般式(30)において、R⁸⁷は炭素数1～6の飽和若しくは不飽和の炭化水素基、又は置換基を有してもよいアリール基であり、R⁸⁸は水素原子、炭素数1～6の飽和若しくは不飽和の炭化水素基、又は置換基を有してもよいアリール基である。)

【化101】

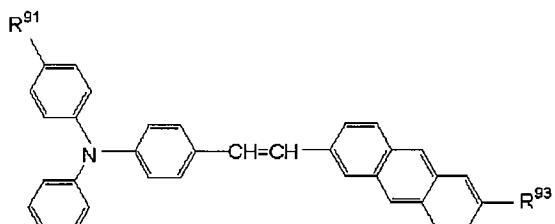
一般式(31) :



(但し、前記一般式(31)において、R⁸⁹は炭素数1～6の飽和若しくは不飽和の炭化水素基、トリフルオロメチル基、又は置換基を有してもよいアリール基であり、R⁹⁰は水素原子、炭素数1～6の飽和若しくは不飽和の炭化水素基、又は置換基を有してもよいアリール基である。)

【化102】

一般式(32) :

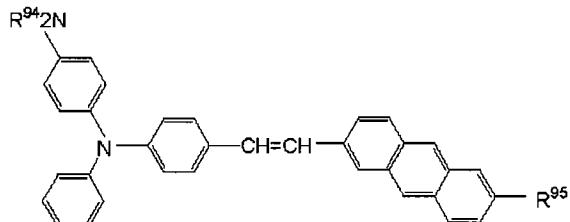


(但し、前記一般式(32)において、R⁹¹及びR⁹²は炭素数1～6の飽和若しくは不飽和の炭化水素基、トリ

基であり、R⁹³は水素原子、炭素数1～6の飽和若しくは不飽和の炭化水素基、又は置換基を有してもよいアリール基である。)

【化103】

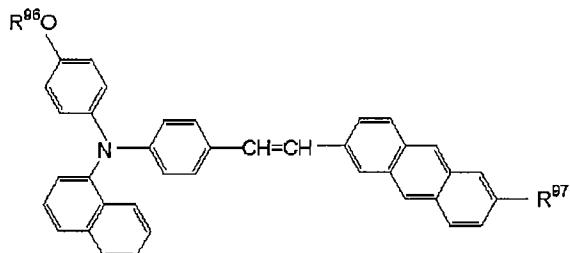
一般式(33)：



(但し、前記一般式(33)において、R⁹⁴は炭素数1～6の飽和若しくは不飽和の炭化水素基、又は置換基を有してもよいアリール基であり、R⁹⁵は水素原子、炭素数1～6の飽和若しくは不飽和の炭化水素基、又は置換基を有してもよいアリール基である。)

【化104】

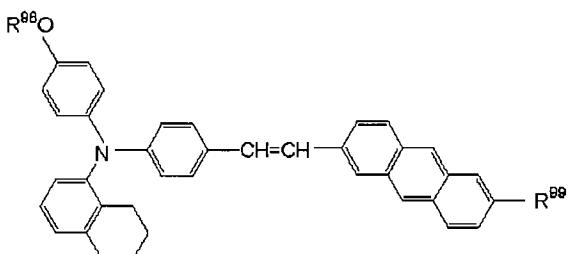
一般式(34)：



(但し、前記一般式(34)において、R⁹⁶は炭素数1～6の飽和若しくは不飽和の炭化水素基、又は置換基を有してもよいアリール基であり、R⁹⁷は水素原子、炭素数1～6の飽和若しくは不飽和の炭化水素基、又は置換基を有してもよいアリール基である。)

【化105】

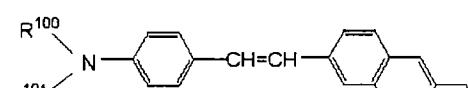
一般式(35)：



(但し、前記一般式(35)において、R⁹⁸は炭素数1～6の飽和又は不飽和の炭化水素基、または置換基を有してもよいアリール基であり、R⁹⁹は水素原子、又は炭素数1～6の飽和又は不飽和の炭化水素基、又は置換基を有してもよいアリール基である。)

【化106】

一般式(36)：

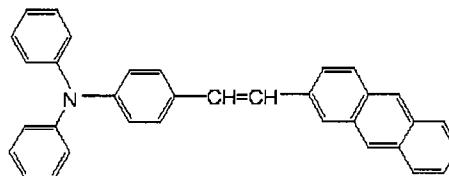


(但し、前記一般式(36)において、R¹⁰⁰及びR¹⁰¹は炭素数1～6の飽和若しくは不飽和の炭化水素基、又は置換基を有してもよいアリール基であり、R¹⁰²は水素原子、炭素数1～6の飽和又は不飽和の炭化水素基、又は置換基を有してもよいアリール基である。)

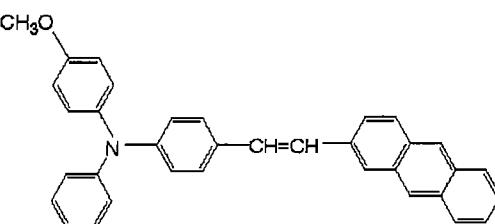
【請求項28】 下記構造式(37)-1、(37)-2、(37)-3、(37)-4、(37)-5、(37)-6、(37)-7、(37)-8、(37)-9、(37)-10、(37)-11又は(37)-12で表わされるアミノスチリルアントラセン化合物を得る、請求項25に記載したアミノスチリルアントラセン化合物の製造方法。

【化107】

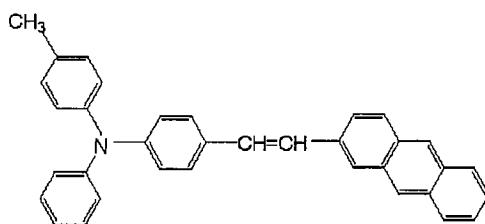
構造式(37)-1：



構造式(37)-2：

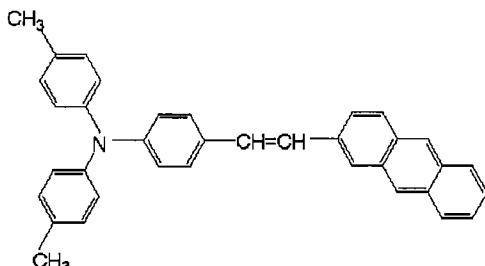


構造式(37)-3：

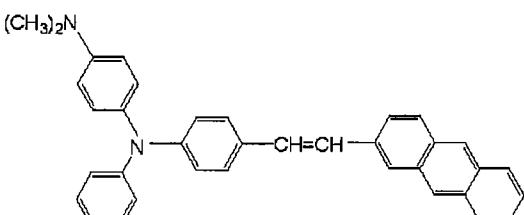


【化108】

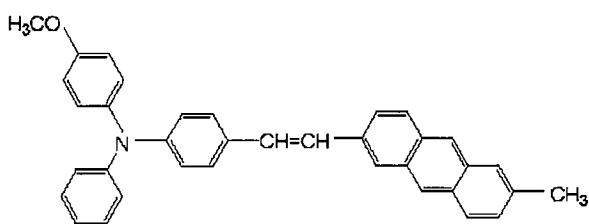
構造式(37)-4：



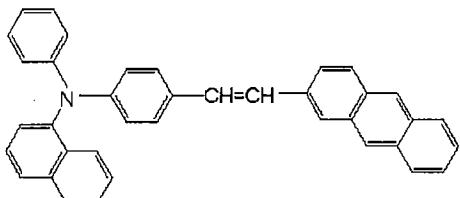
構造式(37)-5：



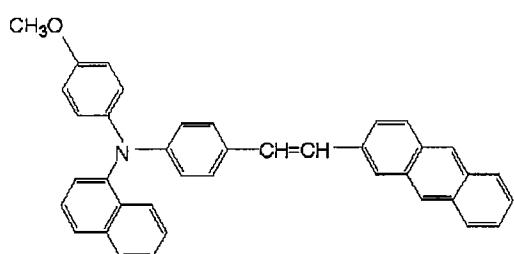
構造式(37)-6:



構造式(37)-7:

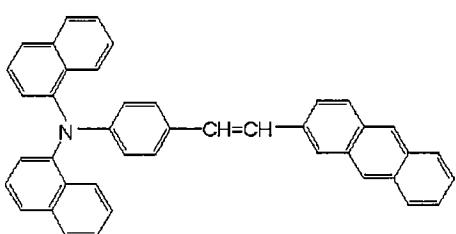


構造式(37)-8:

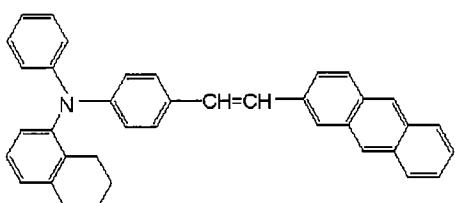


【化110】

構造式(37)-9:

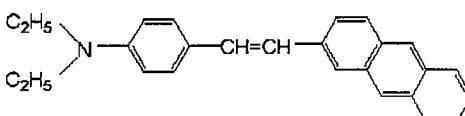


構造式(37)-10:

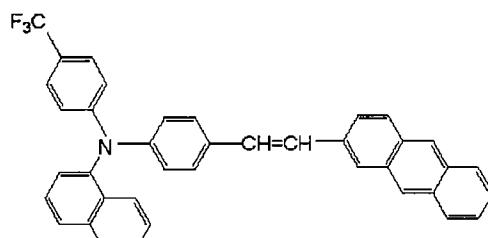


【化111】

構造式(37)-11:



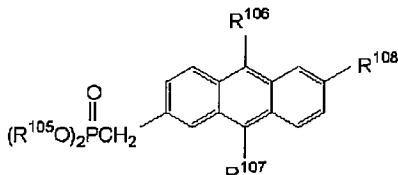
構造式(37)-12:



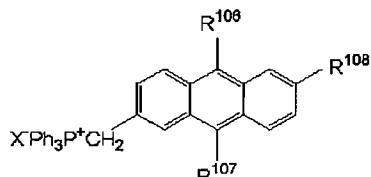
【請求項29】 下記一般式[VI]又は[VII]で表わされるホスホン酸エステル又はホスホニウム塩。

【化112】

一般式[VI]:



一般式[VII]:



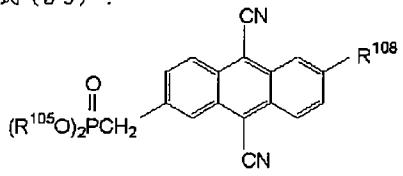
(但し、前記一般式[VI]及び[VII]において、R105は炭化水素基であり、R106及びR107は互いに同一の若しくは異なる基であって、それらの少なくとも1つが水素原子、シアノ基、フルオロアルキル基、ニトロ基又はハロゲン原子であり、R108は水素原子、炭素数1以上の飽和若しくは不飽和の炭化水素基、又は置換基を有してもよいアリール基であり、Xはハロゲン原子である。)

【請求項30】 前記R105が炭素数1~4の飽和炭化水素基である、請求項29に記載したホスホン酸エステル又はホスホニウム塩。

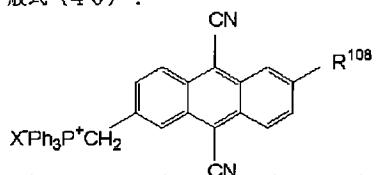
【請求項31】 下記一般式(39)又は(40)で表わされる、請求項29に記載したホスホン酸エステル又はホスホニウム塩。

【化113】

一般式 (39) :



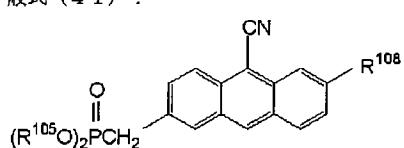
一般式 (40) :



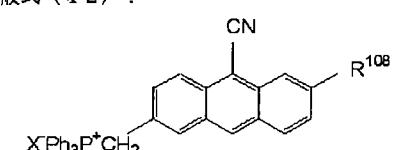
【請求項32】 下記一般式(41)又は(42)で表わされる、請求項29に記載したホスホン酸エステル又はホスホニウム塩。

【化114】

一般式 (41) :



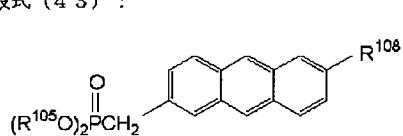
一般式 (42) :



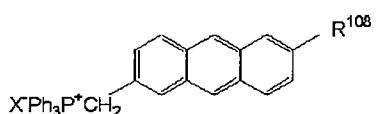
【請求項33】 下記一般式(43)又は(44)で表わされる、請求項29に記載したホスホン酸エステル又はホスホニウム塩。

【化115】

一般式 (43) :



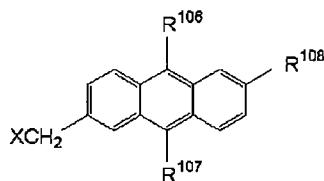
一般式 (44) :



【請求項34】 下記一般式 [VIII] で表わされるハロゲン化アリール化合物と、下記一般式 [IX] で表わされる亜リン酸トリアルキル又はトリフェニルホスフィン (PPh_3) とを反応させることによって、下記一般式 [VI] 又は [VII] で表わされるホスホン酸エステル又はホスホニウム塩を得る、ホスホン酸エステル又はホスホニウム塩の製造方法。

【化116】

一般式 [VIII] :



(但し、前記一般式 [VIII] において、 R^{106} 及び R^{107} は互いに同一の若しくは異なる基であって、それらの少なくとも1つが水素原子、シアノ基、フルオロアルキル基、ニトロ基又はハロゲン原子であり、 R^{108} は水素原子、炭素数1以上の飽和若しくは不飽和の炭化水素基、又は置換基を有してもよいアリール基であり、Xはハロゲン原子である。)

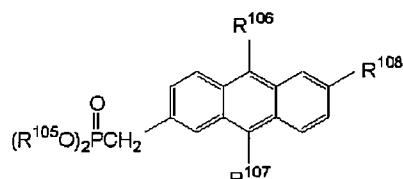
一般式 [IX] :



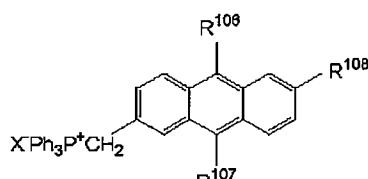
(但し、前記一般式 [IX] において、 R^{105} は炭化水素基である。)

【化117】

一般式 (VI) :



一般式 [VII] :



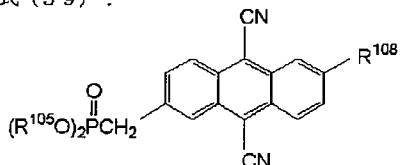
(但し、前記一般式 [VI] 及び [VII] において、 R^{105} 、 R^{106} 、 R^{107} 、 R^{108} 及びXは前記したものと同じである。)

【請求項35】 前記 R^{105} を炭素数1～4の飽和炭化水素基とする、請求項34に記載したホスホン酸エステル又はホスホニウム塩の製造方法。

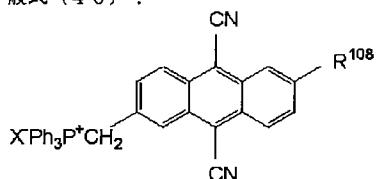
【請求項36】 下記一般式(39)又は(40)で表わされるホスホン酸エステル又はホスホニウム塩を得る、請求項34に記載したホスホン酸エステル又はホスホニウム塩の製造方法。

【化118】

一般式(39) :



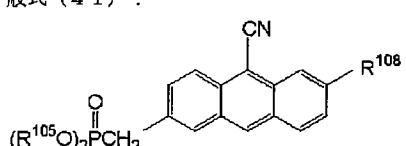
一般式(40) :



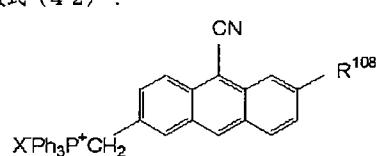
【請求項37】 下記一般式(41)又は(42)で表わされるホスホン酸エステル又はホスホニウム塩を得る、請求項34に記載したホスホン酸エステル又はホスホニウム塩の製造方法。

【化119】

一般式(41) :



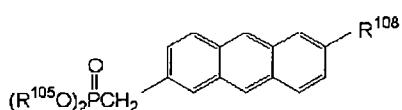
一般式(42) :



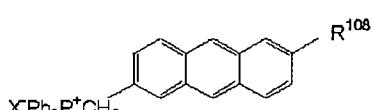
【請求項38】 下記一般式(43)又は(44)で表わされるホスホン酸エステル又はホスホニウム塩を得る、請求項34に記載したホスホン酸エステル又はホスホニウム塩の製造方法。

【化120】

一般式(43) :



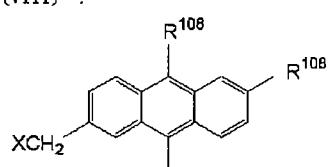
一般式(44) :



【請求項39】 下記一般式[VIII]で表わされるハロゲン化アリール化合物。

【化121】

一般式(VIII) :

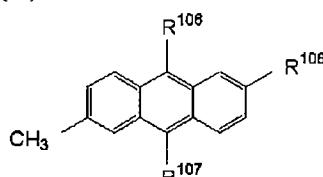


(但し、前記一般式[VIII]において、R106及びR107は互いに同一の若しくは異なる基であって、それらの少なくとも一つが水素原子、シアノ基、フルオロアルキル基、ニトロ基又はハロゲン原子であり、R108は水素原子、炭素数1以上の飽和若しくは不飽和の炭化水素基、又は置換基を有してもよいアリール基であり、Xはハロゲン原子である。)

【請求項40】 下記一般式[X]で表わされるアントラセン化合物と、下記一般式[XI]で表わされるN-ハロゲン化スクシンイミドとを反応させることによって、下記一般式[VIII]で表わされるハロゲン化アリール化合物を得る、ハロゲン化アリール化合物の製造方法。

【化122】

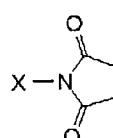
一般式(X) :



(但し、前記一般式[X]において、R106及びR107は互いに同一の若しくは異なる基であって、それらの少なくとも一つが水素原子、シアノ基、フルオロアルキル基、ニトロ基又はハロゲン原子であり、R108は水素原子、炭素数1以上の飽和若しくは不飽和の炭化水素基、又は置換基を有してもよいアリール基である。)

【化123】

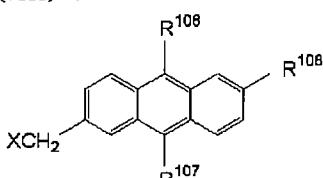
一般式(XI) :



(但し、前記一般式[XI]において、Xはハロゲン原子である。)

【化124】

一般式[VIII] :



(但し、前記一般式[VIII]において、R106、R107、R108及びXは前記したものと同じである。)

【発明の詳細な説明】

【0001】

【発明の属する技術分野】本発明は、所望の発光色を呈する有機発光材料として好適なアミノスチリルアントラセン化合物及びその合成中間体、並びにこれらの製造方法に関するものである。

【0002】

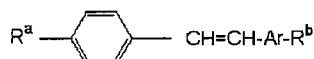
り、視野角依存性の無いフラットパネルディスプレイの1候補として、有機電界発光素子（EL素子）等が近時注目されており、その構成材料としての有機発光材料への関心が高まっている。有機発光材料の第一の利点は、分子設計によって材料の光学的な性質をある程度コントロールできるところにあり、これによって、赤、青、緑の3原色発光をすべてそれぞれの発光材料で作成したフルカラー有機発光素子の実現が可能である。

【0003】下記一般式〔A〕で示されるスチリル化合物は、導入される置換基に依存して、可視部領域に青～赤の強い発光を呈することから、有機電界発光素子材料に限らず、さまざまな用途に利用可能である。さらに、これら材料は昇華性であり、真空蒸着のプロセスによって、均一なアモルファス膜を形成しうる利点がある。今日では分子軌道計算等により、材料の光学的な性質がある程度までは予想可能であるが、実際には、要求される材料を高効率に製造する技術が産業上最も重要であることは、言うまでもない。

【0004】

【化125】

一般式〔A〕：



（但し、前記一般式〔A〕において、Arは置換基を有してもよいアリール基であり、R^a及びR^bはそれぞれ、水素原子、飽和若しくは不飽和の炭化水素基、置換基を有してもよいアリール基、シアノ基、ハロゲン原子、ニトロ基、炭化水素オキシ基又は炭化水素アミノ基を示し、これらは同一であっても異なってもよい。）

【0005】

【発明が解決しようとする課題】これまで、有機発光材料として前記一般式〔A〕に属する多くの化合物が製造されてきたが、これらの材料の発光は多くが青～緑であり、黄色～赤色の発光を呈するものはわずかに報告されているのみであり〔電子情報通信学会、技術研究報告書、有機エレクトロニクス、17, 7(1992)、Inorganic and Organic Electroluminescence 96 Berlin, 101(1996)等〕、またその高効率な製造法も確立されていなかった。

【0006】本発明の目的は、上記のような現状に鑑み、強い発光を呈する特に黄色～赤色の有機発光材料として好適な化合物及びその合成中間体と、これらを高効率に製造する方法を提供することにある。

【0007】

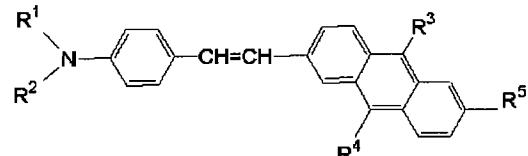
【課題を解決するための手段】本発明は、上記課題を解決するために銳意検討した結果、一般式〔I〕、〔II〕、〔III〕又は〔IV〕で表わされるアミノスチリルアントラセン化合物が強い発光を呈し、黄色～赤色の発光

率な製造方法を確立し、本発明に到達したものである。

【0008】即ち、本発明はまず、下記一般式〔I〕、〔II〕、〔III〕又は〔IV〕で表わされるアミノスチリルアントラセン化合物（以下、本発明の化合物と称する。）に係るものである。

【化126】

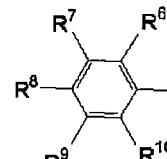
一般式〔I〕：



〔但し、前記一般式〔I〕において、R²は無置換のアリール基であり、R¹は下記一般式(1)で表わされるアリール基であり、

【化127】

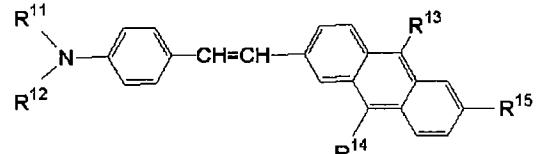
一般式(1)：



〔但し、前記一般式(1)において、R⁶、R⁷、R⁸、R⁹及びR¹⁰は互いに同一の若しくは異なる基であつて、水素原子、炭素数1以上の飽和若しくは不飽和の炭化水素オキシ基、炭化水素基、炭化水素アミノ基、フルオロアルキル基、又は置換基を有してもよいアリール基である。〕、R³及びR⁴は互いに同一の若しくは異なる基であつて、それらの少なくとも1つが水素原子、シアノ基、フルオロアルキル基、ニトロ基又はハロゲン原子であり、R⁵は水素原子、炭素数1以上の飽和若しくは不飽和の炭化水素基、又は置換基を有してもよいアリール基である。〕

【化128】

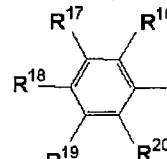
一般式〔II〕：



〔但し、前記一般式〔II〕において、R¹¹及びR¹²は互いに同一の若しくは異なる基であつて、下記一般式(2)で表わされるアリール基であり、

【化129】

一般式(2)：

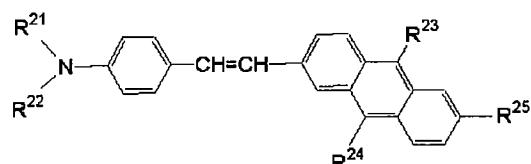


〔但し、前記一般式(2)において、R¹⁶、R¹⁷、

あって、水素原子、炭素数1以上の飽和若しくは不飽和の炭化水素オキシ基、炭化水素基、炭化水素アミノ基、フルオロアルキル基、又は置換基を有してもよいアリール基である。）、R¹³及びR¹⁴は互いに同一の若しくは異なる基であって、それらの少なくとも1つが水素原子、シアノ基、フルオロアルキル基、ニトロ基又はハロゲン原子であり、R¹⁵は水素原子、炭素数1以上の飽和若しくは不飽和の炭化水素基、又は置換基を有してもよいアリール基である。】

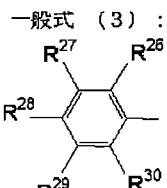
【化130】

一般式〔III〕：



〔但し、前記一般式〔III〕において、R²¹は下記一般式(3)で表わされるアリール基であり、

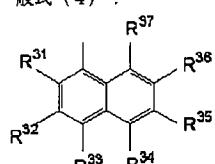
【化131】



（但し、前記一般式(3)において、R²⁶、R²⁷、R²⁸、R²⁹及びR³⁰は互いに同一の若しくは異なる基であって、水素原子、炭素数1以上の飽和若しくは不飽和の炭化水素オキシ基、炭化水素基、炭化水素アミノ基又はフルオロアルキル基である。）、R²²は下記一般式(4)で表わされるアリール基であり、

【化132】

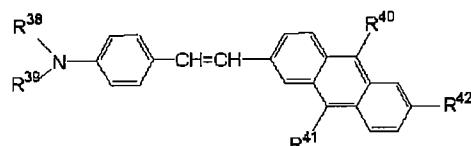
一般式(4)：



（但し、前記一般式(4)において、R³¹、R³²、R³³、R³⁴、R³⁵、R³⁶及びR³⁷は互いに同一の若しくは異なる基であって、水素原子、炭素数1以上の飽和若しくは不飽和の炭化水素オキシ基、炭化水素基、炭化水素アミノ基、フルオロアルキル基、又は置換基を有してもよいアリール基である。）、R²³及びR²⁴は互いに同一の若しくは異なる基であって、それらの少なくとも1つが水素原子、シアノ基、フルオロアルキル基、ニトロ基又はハロゲン原子であり、R²⁵は水素原子、炭素数1以上の飽和若しくは不飽和の炭化水素基、又は置換基を有してもよいアリール基である。】

【化133】

一般式〔IV〕：



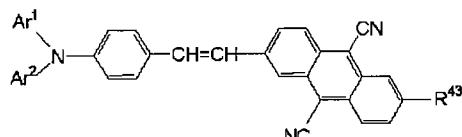
（但し、前記一般式〔IV〕において、R³⁸及びR³⁹は互いに同一の若しくは異なる基であって、水素原子、炭素数1以上の飽和若しくは不飽和の炭化水素基である。）、R⁴⁰及びR⁴¹は互いに同一の若しくは異なる基であって、それらの少なくとも1つが水素原子、シアノ基、フルオロアルキル基、ニトロ基又はハロゲン原子であり、R⁴²は水素原子、炭素数1以上の飽和若しくは不飽和の炭化水素基、又は置換基を有してもよいアリール基である。】

【0009】本発明の化合物は、黄色～赤色の発光色を示す有機発光材料として有効に利用することができ、また、高いガラス転移点及び融点を有する化合物であり、電気的、熱的或いは化学的な安定性に優れている上、非晶質でガラス状態を容易に形成し得るので、蒸着等も行うことができる。

【0010】本発明の化合物は、下記一般式で表わされるものが好ましい。

【化134】

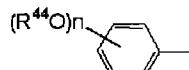
一般式(5)：



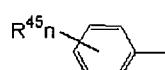
（但し、前記一般式(5)において、Ar¹及びAr²はそれぞれ、置換基を有してもよい互いに同一の若しくは異なるアリール基であって、置換基を有する場合には下記一般式(6)、(7)、(8)、(9)、(10)及び(11)で表わされるアリール基から選ばれた基であり、

【化135】

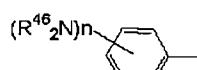
一般式(6)：



一般式(7)：

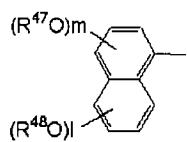


一般式(8)：

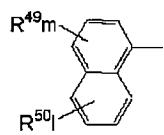


【化136】

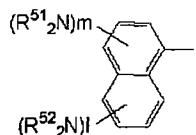
一般式(9) :



一般式(10) :



一般式(11) :

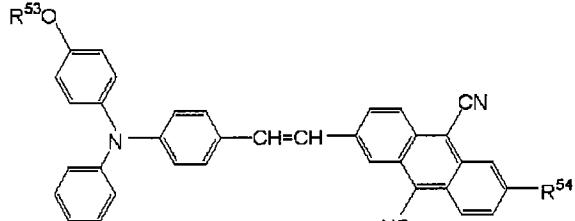


(但し、前記一般式(6)、(7)、(8)、(9)、(10)及び(11)において、R⁴⁴、R⁴⁵及びR⁴⁶は炭素数1以上(好ましくは1~6)の飽和若しくは不飽和の炭化水素基、又はフルオロアルキル基であり、R⁴⁷、R⁴⁸、R⁴⁹、R⁵⁰、R⁵¹及びR⁵²は互いに同一の若しくは異なる、炭素数1以上(好ましくは1~6)の飽和若しくは不飽和の炭化水素基、又はフルオロアルキル基であり、nは0~5の整数であり、mは0~3の整数であり、lは0~3の整数である。)、R⁴³は水素原子、炭素数1以上の飽和若しくは不飽和の炭化水素基、又は置換基を有してもよいアリール基である。)

【0011】本発明の化合物は、より具体的には、下記一般式(12)、(13)、(14)、(15)、(16)、(17)又は(18)で表わされるものがよい。

【化137】

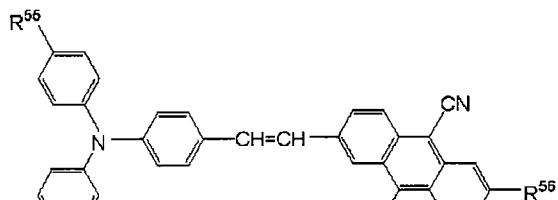
一般式(12) :



(但し、前記一般式(12)において、R⁵³は炭素数1~6の飽和若しくは不飽和の炭化水素基、又は置換基を有してもよいアリール基であり、R⁵⁴は水素原子、炭素数1~6の飽和若しくは不飽和の炭化水素基、又は置換基を有してもよいアリール基である。)

【化138】

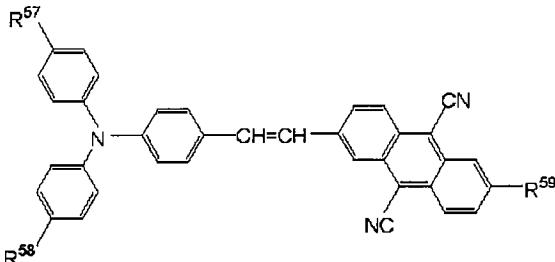
一般式(13) :



(但し、前記一般式(13)において、R⁵⁵は炭素数1~6の飽和若しくは不飽和の炭化水素基、トリフルオロメチル基、又は置換基を有してもよいアリール基であり、R⁵⁶は水素原子、炭素数1~6の飽和若しくは不飽和の炭化水素基、又は置換基を有してもよいアリール基である。)

【化139】

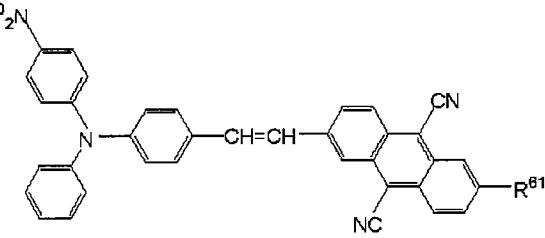
一般式(14) :



(但し、前記一般式(14)において、R⁵⁷及びR⁵⁸は炭素数1~6の飽和若しくは不飽和の炭化水素基、トリフルオロメチル基、又は置換基を有してもよいアリール基であり、R⁵⁹は水素原子、炭素数1~6の飽和若しくは不飽和の炭化水素基、又は置換基を有してもよいアリール基である。)

【化140】

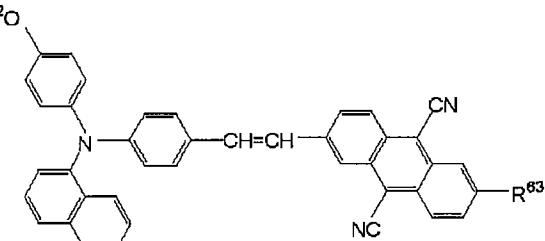
一般式(15) :



(但し、前記一般式(15)において、R⁶⁰は炭素数1~6の飽和若しくは不飽和の炭化水素基、又は置換基を有してもよいアリール基であり、R⁶¹は水素原子、炭素数1~6の飽和若しくは不飽和の炭化水素基、又は置換基を有してもよいアリール基である。)

【化141】

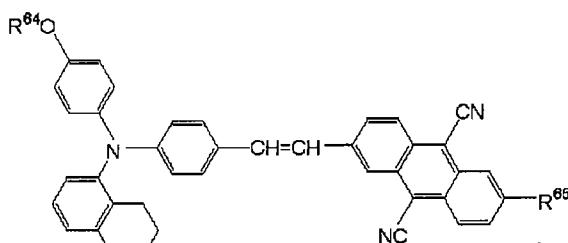
一般式(16) :



(但し、前記一般式(16)において、R⁶²は炭素数1~6の飽和若しくは不飽和の炭化水素基、又は置換基を有してもよいアリール基であり、R⁶³は水素原子、炭素数1~6の飽和若しくは不飽和の炭化水素基、又は置換基を有してもよいアリール基である。)

【化142】

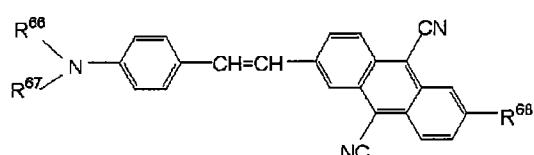
一般式 (17) :



(但し、前記一般式 (17)において、R⁶⁴は炭素数1～6の飽和若しくは不飽和の炭化水素基、又は置換基を有してもよいアリール基であり、R⁶⁵は水素原子、炭素数1～6の飽和若しくは不飽和の炭化水素基、又は置換基を有してもよいアリール基である。)

【化143】

一般式 (18) :

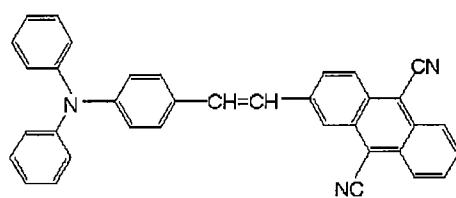


(但し、前記一般式 (18)において、R⁶⁶及びR⁶⁷は炭素数1～6の飽和若しくは不飽和の炭化水素基、又は置換基を有してもよいアリール基であり、R⁶⁸は水素原子、炭素数1～6の飽和若しくは不飽和の炭化水素基、又は置換基を有してもよいアリール基である。)

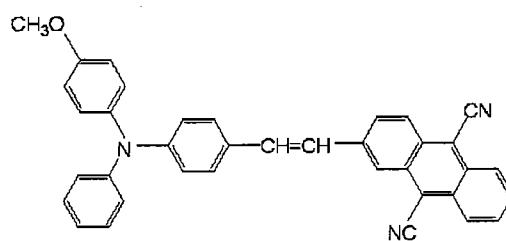
【0012】本発明の化合物は、下記構造式(19)－1、(19)－2、(19)－3、(19)－4、(19)－5、(19)－6、(19)－7、(19)－8、(19)－9、(19)－10、(19)－11又は(19)－12で表わされるものが具体的に例示される。

【化144】

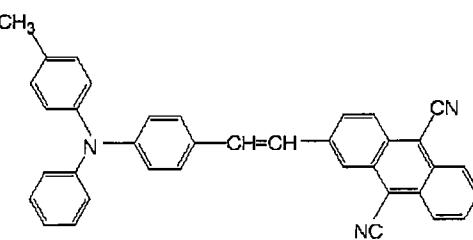
構造式 (19)－1:



構造式 (19)－2:

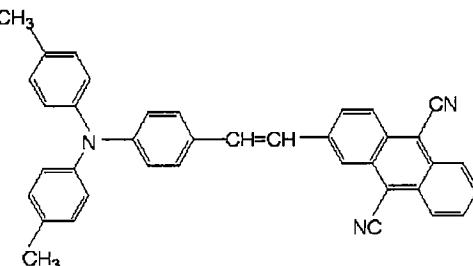


構造式 (19)－3:

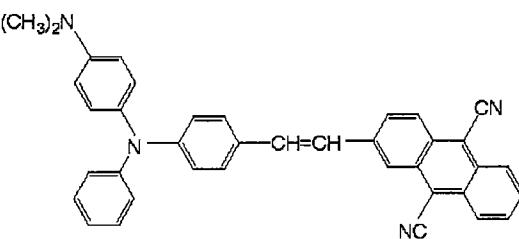


【化145】

構造式 (19)－4:

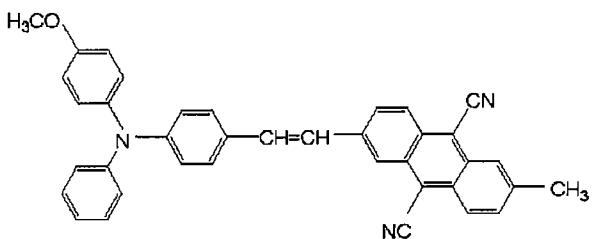


構造式 (19)－5:

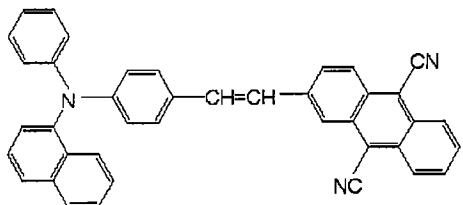


【化146】

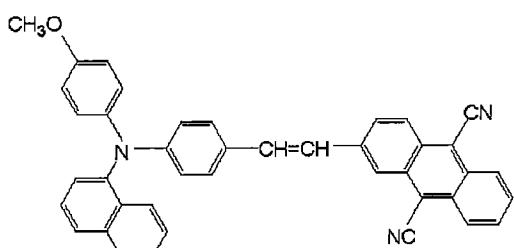
構造式(19)-6:



構造式(19)-7:

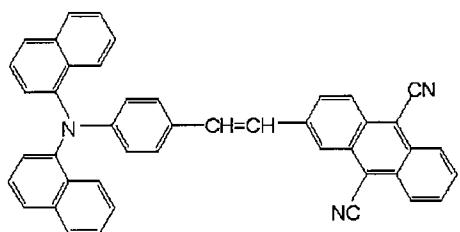


構造式(19)-8:

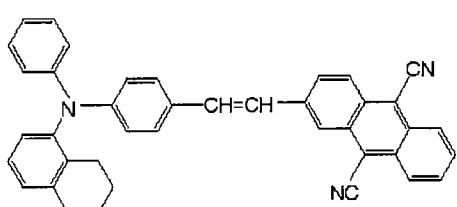


【化147】

構造式(19)-9:

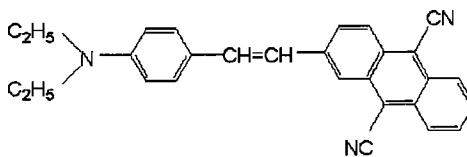


構造式(19)-10:

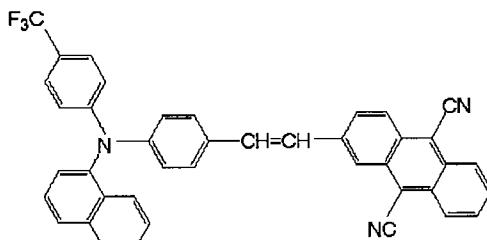


【化148】

構造式(19)-11:



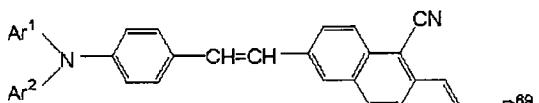
構造式(19)-12:



【0013】本発明の化合物は、下記一般式で表わされるものが好ましい。

【化149】

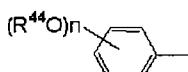
一般式(20):



(但し、前記一般式(20)において、 Ar^1 及び Ar^2 はそれぞれ、置換基を有してもよい互いに同一の若しくは異なるアリール基であって、置換基を有する場合には下記一般式(6)、(7)、(8)、(9)、(10)及び(11)で表わされるアリール基から選ばれた基であり

【化150】

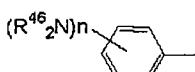
一般式(6):



一般式(7):

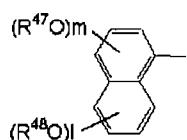


一般式(8):

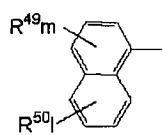


【化151】

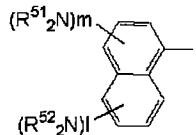
一般式(9) :



一般式(10) :



一般式(11) :

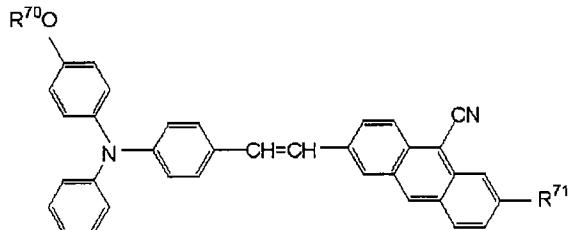


(但し、前記一般式(6)、(7)、(8)、(9)、(10)及び(11)において、R⁴⁴、R⁴⁵、R⁴⁵及びR⁴⁶は炭素数1以上(好ましくは1～6)の飽和若しくは不飽和の炭化水素基、又はフルオロアルキル基であり、R⁴⁷、R⁴⁸、R⁴⁹、R⁵⁰、R⁵¹及びR⁵²は互いに同一の若しくは異なる炭素数1以上(好ましくは1～6)の飽和若しくは不飽和の炭化水素基、又はフルオロアルキル基であり、nは0～5の整数であり、mは0～3の整数であり、lは0～3の整数である。)、R⁶⁹は水素原子、炭素数1以上の飽和若しくは不飽和の炭化水素基、又は置換基を有してもよいアリール基である。)

【0014】本発明の化合物は、より具体的には、下記一般式(21)、(22)、(23)、(24)、(25)、(26)又は(27)で表わされるのがよい。

【化152】

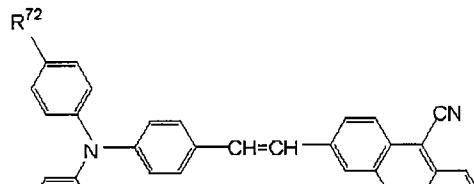
一般式(21) :



(但し、前記一般式(21)において、R⁷⁰は炭素数1～6の飽和若しくは不飽和の炭化水素基、又は置換基を有してもよいアリール基であり、R⁷¹は水素原子、炭素数1～6の飽和若しくは不飽和の炭化水素基、又は置換基を有してもよいアリール基である。)

【化153】

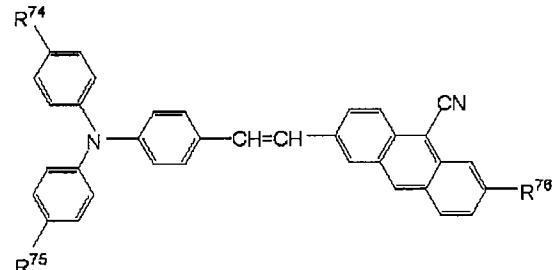
一般式(22) :



(但し、前記一般式(22)において、R⁷²は炭素数1～6の飽和若しくは不飽和の炭化水素基、トリフルオロメチル基、又は置換基を有してもよいアリール基であり、R⁷³は水素原子、炭素数1～6の飽和若しくは不飽和の炭化水素基、又は置換基を有してもよいアリール基である。)

【化154】

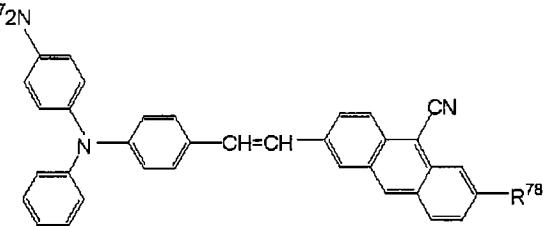
一般式(23) :



(但し、前記一般式(23)において、R⁷⁴及びR⁷⁵は炭素数1～6の飽和若しくは不飽和の炭化水素基、トリフルオロメチル基、又は置換基を有してもよいアリール基であり、R⁷⁶は水素原子、炭素数1～6の飽和若しくは不飽和の炭化水素基、又は置換基を有してもよいアリール基である。)

【化155】

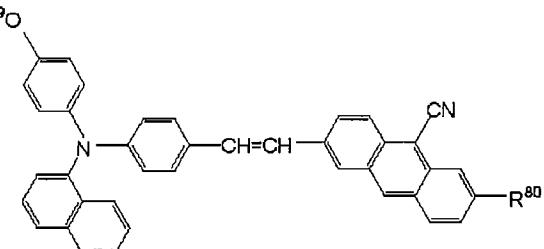
一般式(24) :



(但し、前記一般式(24)において、R⁷⁷は炭素数1～6の飽和若しくは不飽和の炭化水素基、又は置換基を有してもよいアリール基であり、R⁷⁸は水素原子、炭素数1～6の飽和若しくは不飽和の炭化水素基、又は置換基を有してもよいアリール基である。)

【化156】

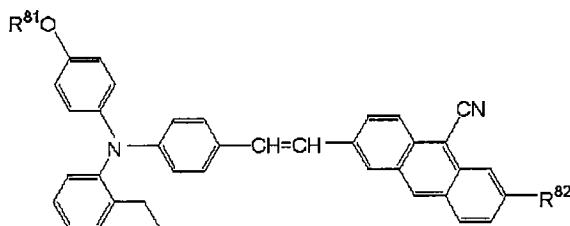
一般式(25) :



(但し、前記一般式(25)において、R⁷⁹は炭素数1～6の飽和若しくは不飽和の炭化水素基、又は置換基を有してもよいアリール基であり、R⁸⁰は水素原子、炭素数1～6の飽和若しくは不飽和の炭化水素基、又は置換基を有してもよいアリール基である。)

【化157】

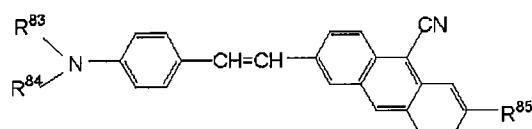
一般式(26) :



(但し、前記一般式(26)において、R81は炭素数1～6の飽和若しくは不飽和の炭化水素基、又は置換基を有してもよいアリール基であり、R82は水素原子、炭素数1～6の飽和若しくは不飽和の炭化水素基、又は置換基を有してもよいアリール基である。)

【化158】

一般式(27) :

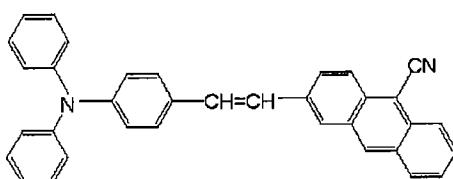


(但し、前記一般式(27)において、R82及びR83は炭素数1～6の飽和若しくは不飽和の炭化水素基、又は置換基を有してもよいアリール基であり、R85は水素原子、炭素数1～6の飽和若しくは不飽和の炭化水素基、又は置換基を有してもよいアリール基である。)

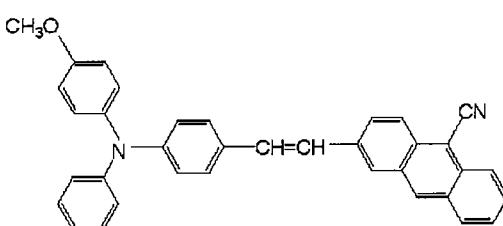
【0015】 本発明の化合物は下記構造式(28)－1、(28)－2、(28)－3、(28)－4、(28)－5、(28)－6、(28)－7、(28)－8、(28)－9、(28)－10、(28)－11又は(28)－12で表わされるものが具体的に例示される。

【化159】

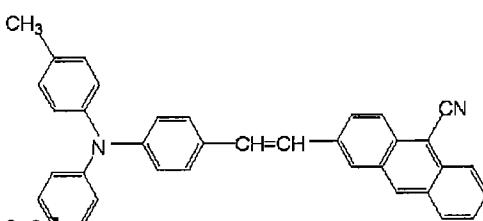
構造式(28)－1 :



構造式(28)－2 :

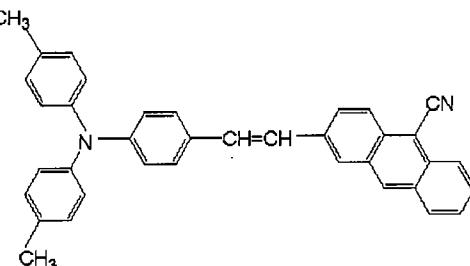


構造式(28)－3 :

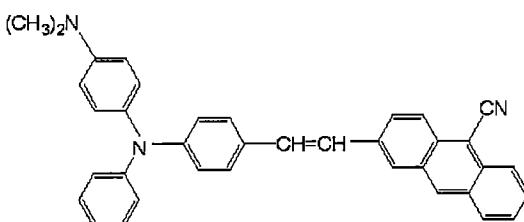


【化160】

構造式(28)－4 :

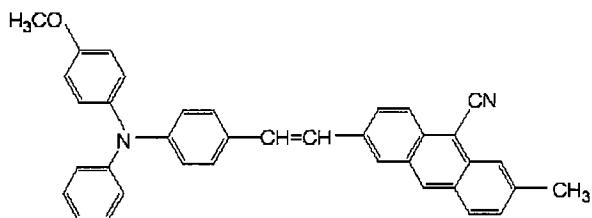


構造式(28)－5 :

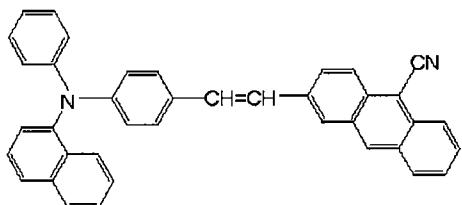


【化161】

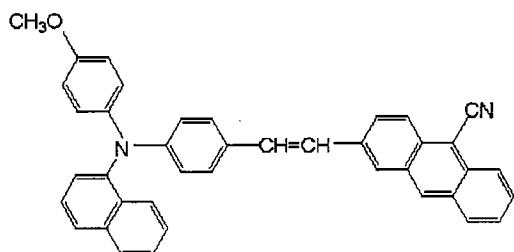
構造式(28)-6:



構造式(28)-7:

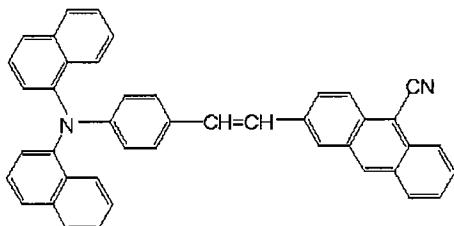


構造式(28)-8:

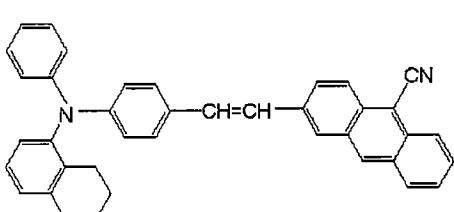


【化162】

構造式(28)-9:

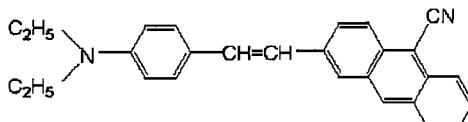


構造式(28)-10:

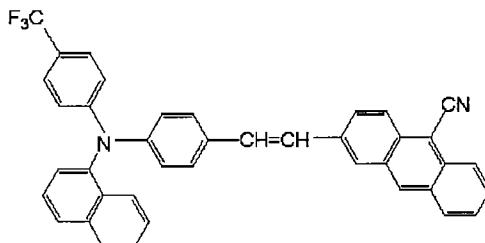


【化163】

構造式(28)-11:



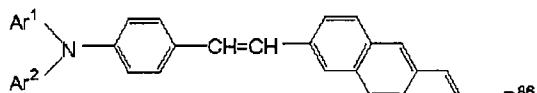
構造式(28)-12:



【0016】本発明の化合物は、下記一般式で表わされるものが好ましい。

【化164】

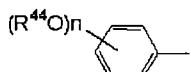
一般式(29):



(但し、前記一般式(29)において、 Ar^1 及び Ar^2 はそれぞれ、置換基を有してもよい互いに同一の若しくは異なるアリール基であって、置換基を有する場合には下記一般式(6)、(7)、(8)、(9)、(10)及び(11)で表わされるアリール基から選ばれた基であり

【化165】

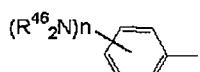
一般式(6):



一般式(7):

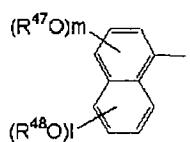


一般式(8):

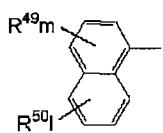


【化166】

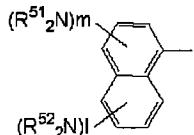
一般式(9)：



一般式 (10) :



一般式 (11) :

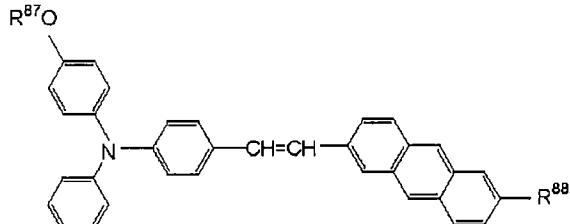


(但し、前記一般式(6)、(7)、(8)、(9)、(10)及び(11)において、R⁴⁴、R⁴⁵及びR⁴⁶は炭素数1以上(好ましくは1~6)の飽和若しくは不飽和の炭化水素基、又はフルオロアルキル基であり、R⁴⁷、R⁴⁸、R⁴⁹、R⁵⁰、R⁵¹及びR⁵²は互いに同一の又は異なる、炭素数1以上(好ましくは1~6)の飽和若しくは不飽和の炭化水素基、又はフルオロアルキル基であり、nは0~5の整数であり、mは0~3の整数であり、lは0~3の整数である。)、R⁸⁶は水素原子、炭素数1以上の飽和若しくは不飽和の炭化水素基、又は置換基を有してもよいアリール基である。)

【0017】 本発明の化合物は、より具体的には、下記一般式(30)、(31)、(32)、(33)、(34)、(35)又は(36)で表わされるものがよい。

【化 167】

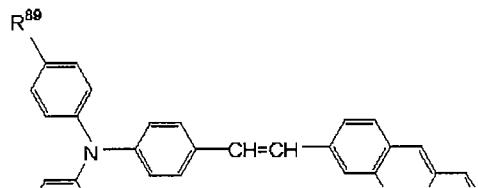
一般式 (30) :



(但し、前記一般式(30)において、R⁸⁷は炭素数1～6の飽和若しくは不飽和の炭化水素基、又は置換基を有してもよいアリール基であり、R⁸⁸は水素原子、炭素数1～6の飽和若しくは不飽和の炭化水素基、又は置換基を有してもよいアリール基である。)

【化 168】

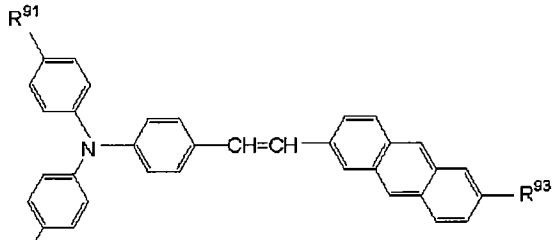
一般式 (31) :



(但し、前記一般式(31)において、R⁸⁹は炭素数1～6の飽和若しくは不飽和の炭化水素基、トリフルオロメチル基、又は置換基を有してもよいアリール基であり、R⁹⁰は水素原子、炭素数1～6の飽和若しくは不飽和の炭化水素基、又は置換基を有してもよいアリール基である。)

【化169】

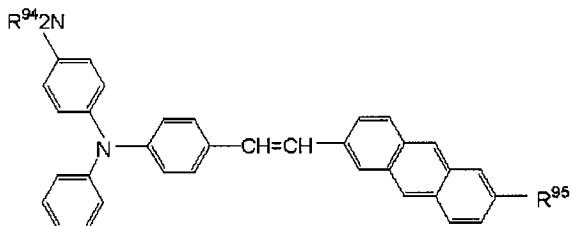
一般式(32)：



(⁹² 値し、前記一般式(32)において、R⁹¹及びR⁹²は炭素数1～6の飽和若しくは不飽和の炭化水素基、トリフルオロメチル基、又は置換基を有してもよいアリール基であり、R⁹³は水素原子、炭素数1～6の飽和若しくは不飽和の炭化水素基、又は置換基を有してもよいアリール基である。)

【化 1 7 0】

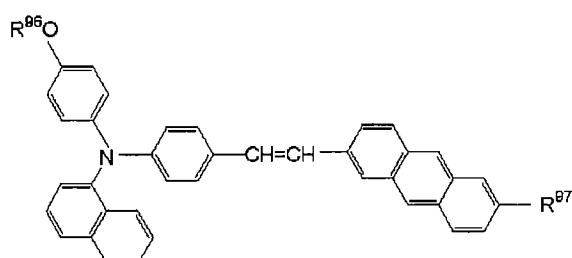
一般式 (33) :



(但し、前記一般式(33)において、R⁹⁴は炭素数1～6の飽和若しくは不飽和の炭化水素基、又は置換基を有してもよいアリール基であり、R⁹⁵は水素原子、炭素数1～6の飽和若しくは不飽和の炭化水素基、又は置換基を有してもよいアリール基である。)

【化171】

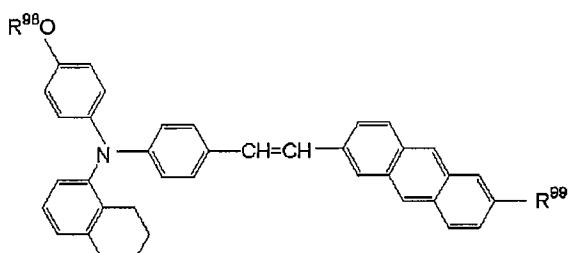
一般式(34)：



(但し、前記一般式(34)において、R₉₆は炭素数1～6の飽和若しくは不飽和の炭化水素基、又は置換基を有してもよいアリール基であり、R₉₇は水素原子、炭素数1～6の飽和若しくは不飽和の炭化水素基、又は置換基を有してもよいアリール基である。)

【化 172】

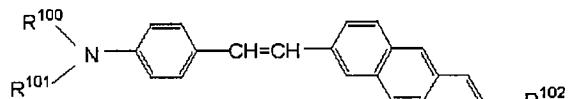
一般式(35)：



(但し、前記一般式(35)において、R⁹⁸は炭素数1～6の飽和若しくは不飽和の炭化水素基、又は置換基を有してもよいアリール基であり、R⁹⁹は水素原子、炭素数1～6の飽和若しくは不飽和の炭化水素基、又は置換基を有してもよいアリール基である。)

【化173】

一般式(36)：

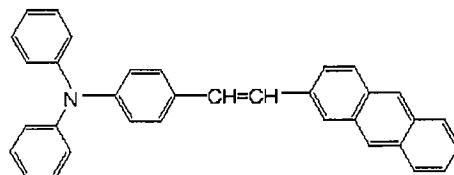


(但し、前記一般式(36)において、R¹⁰⁰及びR¹⁰¹は炭素数1～6の飽和若しくは不飽和の炭化水素基、又は置換基を有していてもよいアリール基であり、R¹⁰²は水素原子、炭素数1～6の飽和若しくは不飽和の炭化水素基、又は置換基を有してもよいアリール基である。)

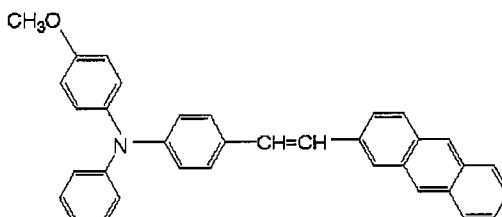
【0018】本発明の化合物は、下記構造式(37)-1、(37)-2、(37)-3、(37)-4、(37)-5、(37)-6、(37)-7、(37)-8、(37)-9、(37)-10、(37)-11又は(37)-12で表わされるものが具体的に例示される。

【化174】

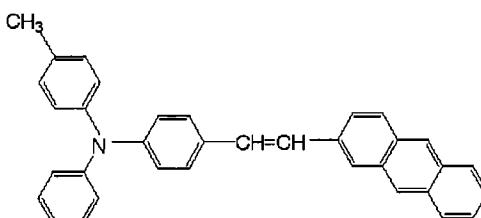
構造式(37)-1：



構造式(37)-2：

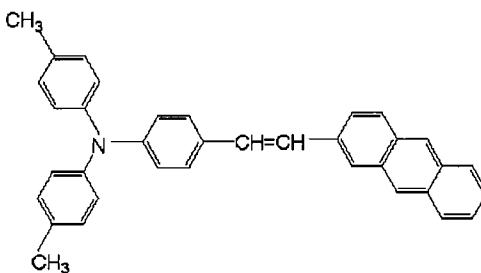


構造式(37)-3：

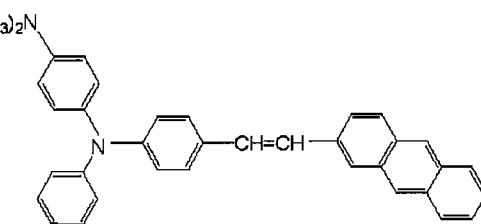


【化175】

構造式(37)-4：

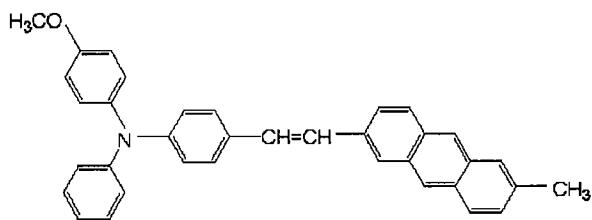


構造式(37)-5：

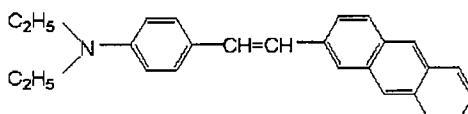


【化176】

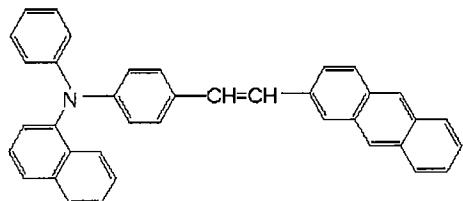
構造式(37)-6:



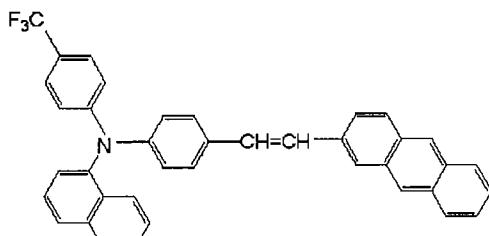
構造式(37)-11:



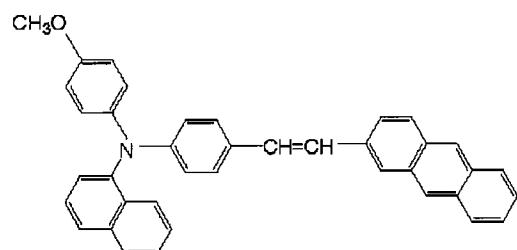
構造式(37)-7:



構造式(37)-12:

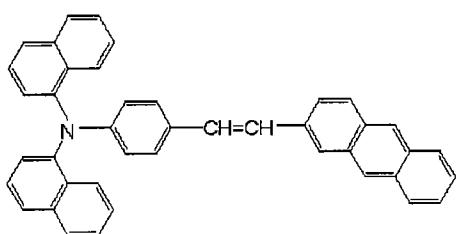


構造式(37)-8:

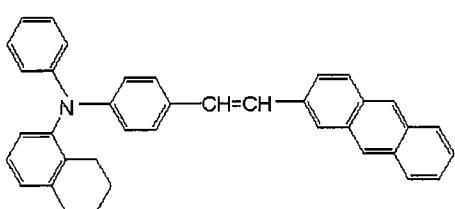


【化177】

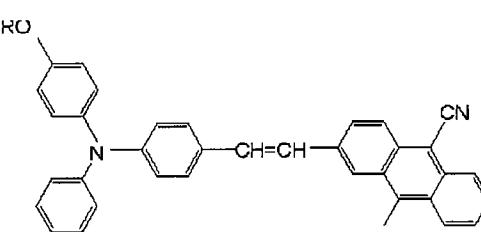
構造式(37)-9:



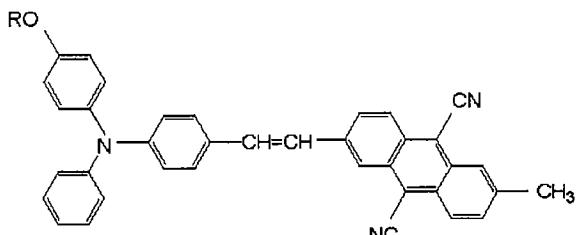
構造式(37)-10:



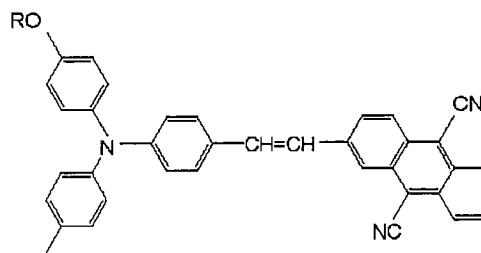
【化178】



R=C₂H₅, i-C₃H₇, i-C₄H₉, t-C₄H₉,
cyclo-C₆H₁₀, C₆H₅

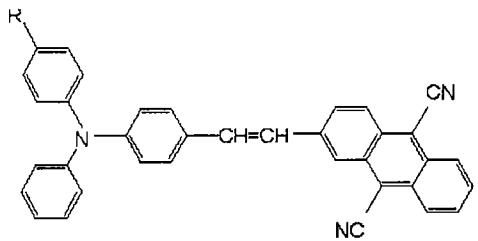


R=CH₃, C₂H₅, i-C₃H₇, i-C₄H₉, t-C₄H₉,
cyclo-C₆H₁₀, C₆H₅

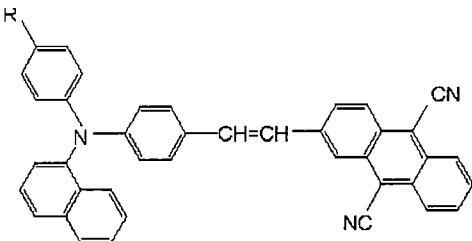


R=CH₃, C₂H₅, i-C₃H₇, i-C₄H₉, t-C₄H₉,
cyclo-C₆H₁₀, C₆H₅

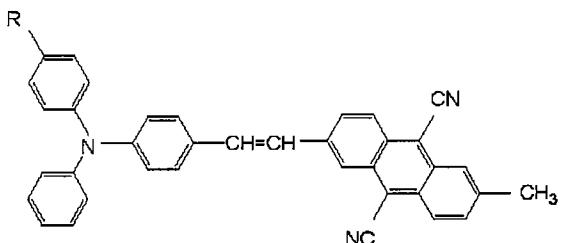
【化180】



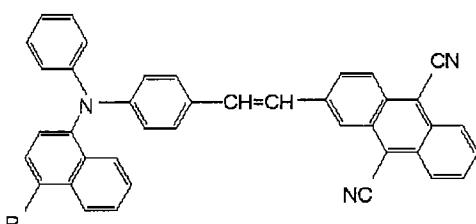
R=C₂H₅, i-C₃H₇, i-C₄H₉, t-C₄H₉,
cyclo-C₆H₁₀, C₆H₅



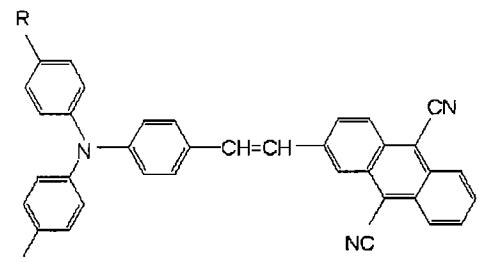
R=C₂H₅, i-C₃H₇, i-C₄H₉, t-C₄H₉,
cyclo-C₆H₁₀, C₆H₅



R=CH₃, C₂H₅, i-C₃H₇, i-C₄H₉, t-C₄H₉,
cyclo-C₆H₁₀, C₆H₅

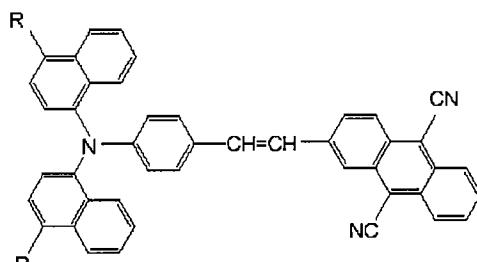


R=CH₃, C₂H₅, i-C₃H₇, i-C₄H₉, t-C₄H₉,
cyclo-C₆H₁₀, C₆H₅



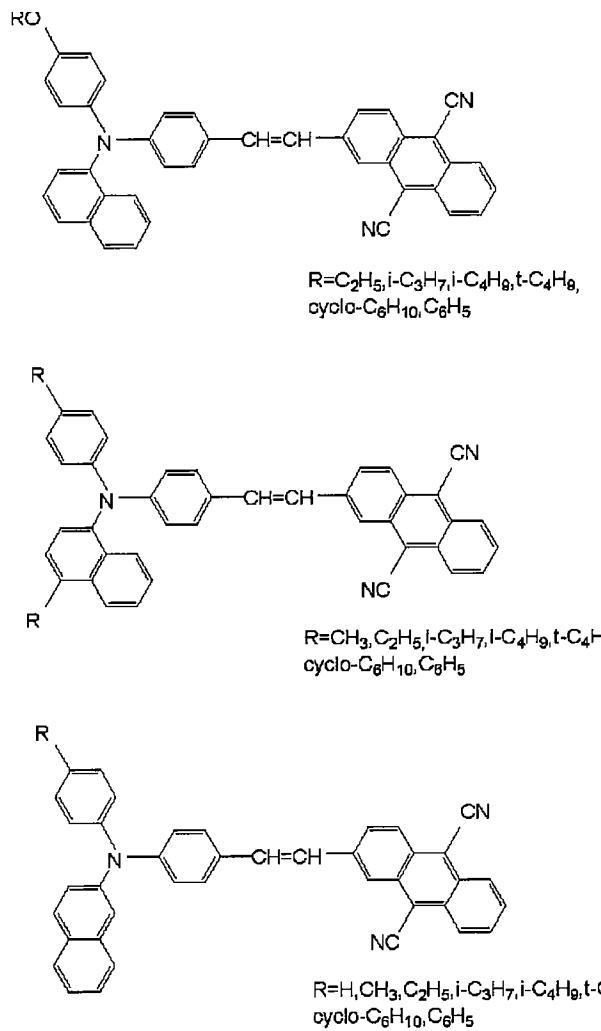
R=C₂H₅, i-C₃H₇, i-C₄H₉, t-C₄H₉,
cyclo-C₆H₁₀, C₆H₅

【化181】

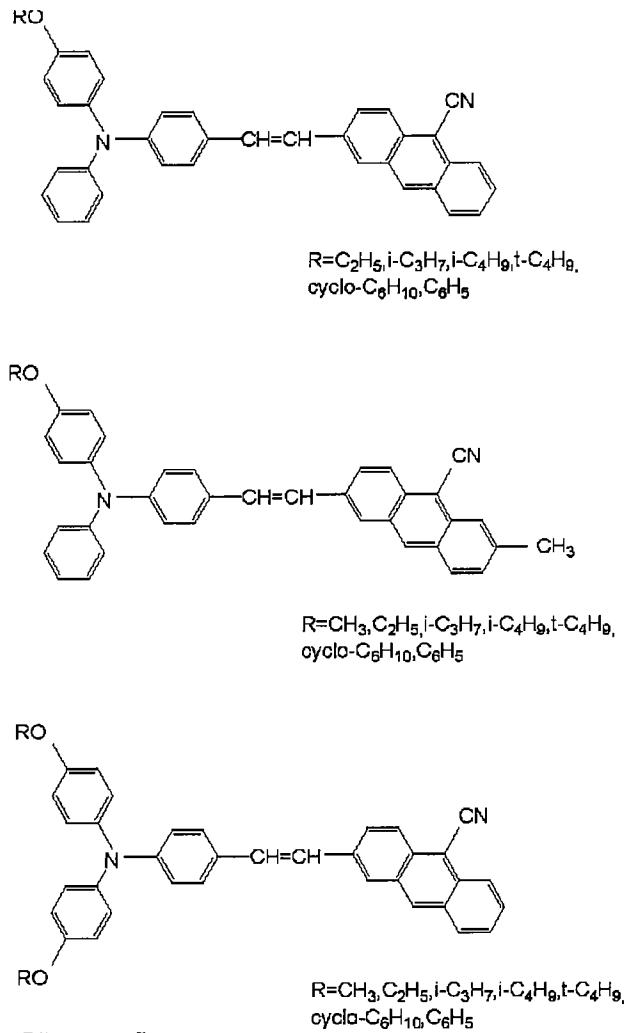
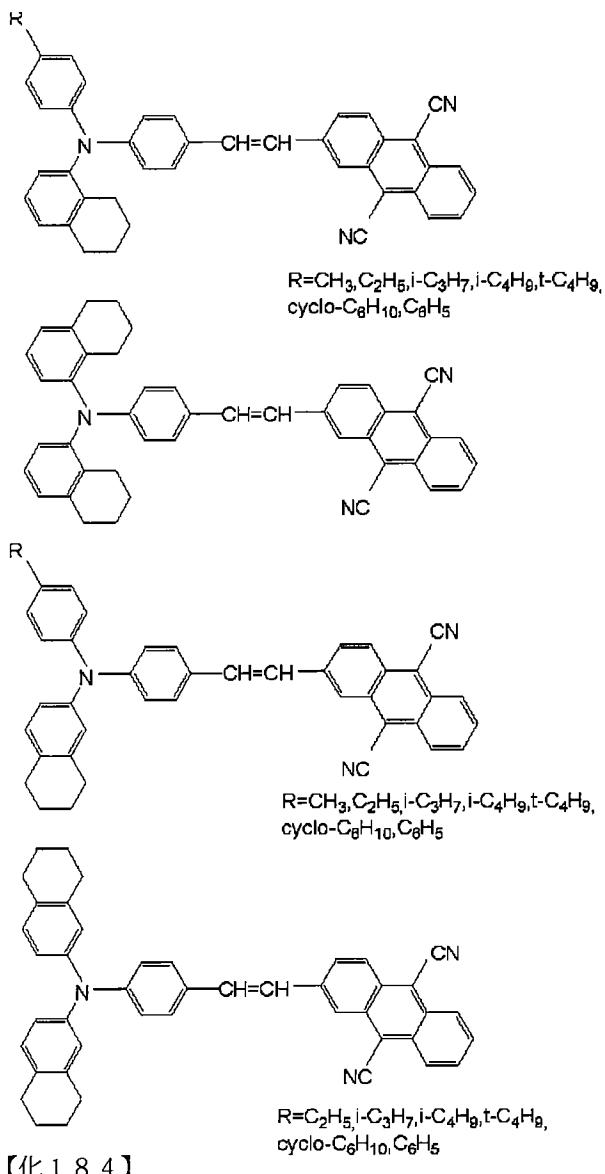


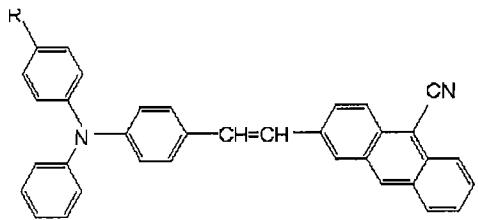
R=CH₃, C₂H₅, i-C₃H₇, i-C₄H₉, t-C₄H₉,
cyclo-C₆H₁₀, C₆H₅

【化182】

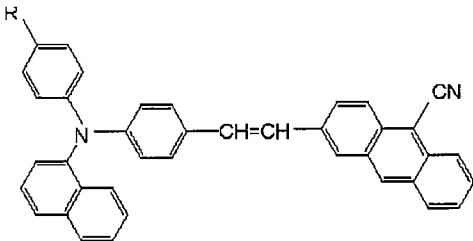


【化 183】

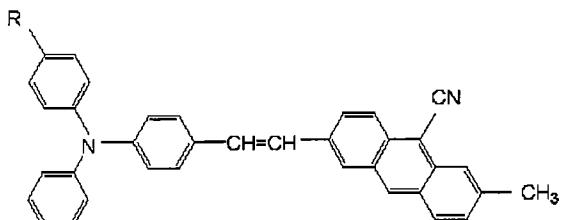




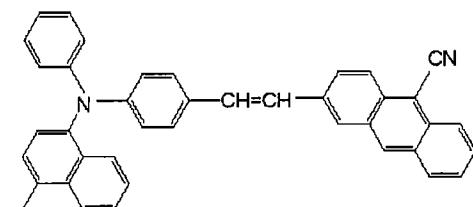
R=C₂H₅, i-C₃H₇, i-C₄H₉, t-C₄H₉,
cyclo-C₆H₁₀, C₆H₅



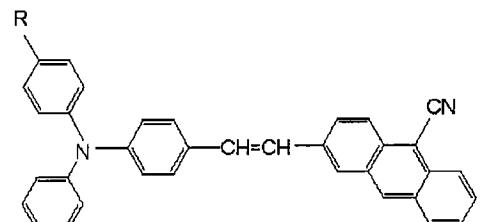
R=C₂H₅, i-C₃H₇, i-C₄H₉, t-C₄H₉,
cyclo-C₆H₁₀, C₆H₅



R=CH₃, C₂H₅, i-C₃H₇, i-C₄H₉, t-C₄H₉,
cyclo-C₆H₁₀, C₆H₅

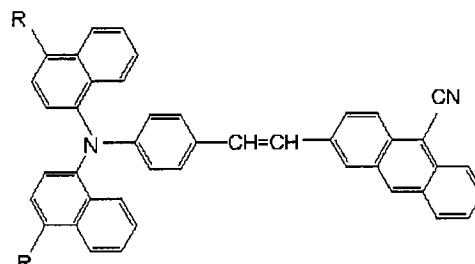


R=CH₃, C₂H₅, i-C₃H₇, i-C₄H₉, t-C₄H₉,
cyclo-C₆H₁₀, C₆H₅



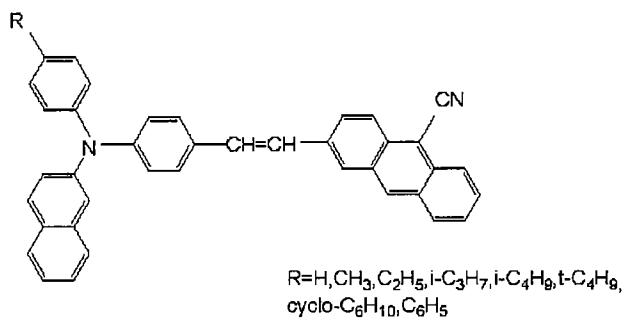
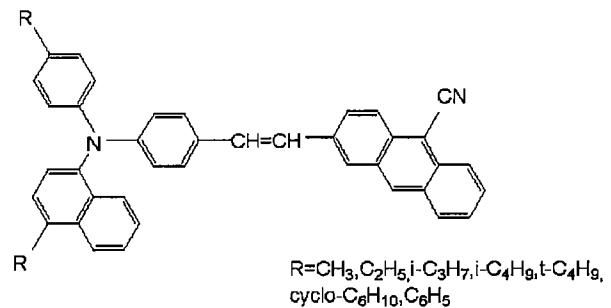
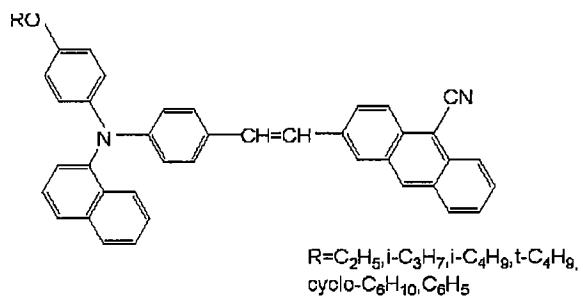
R=C₂H₅, i-C₃H₇, i-C₄H₉, t-C₄H₉,
cyclo-C₆H₁₀, C₆H₅

【化186】

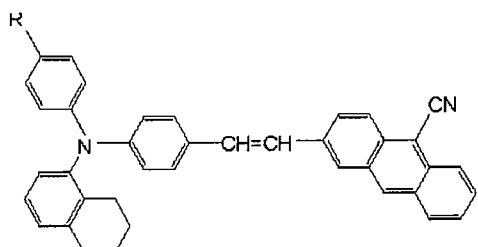


R=CH₃, C₂H₅, i-C₃H₇, i-C₄H₉, t-C₄H₉,
cyclo-C₆H₁₀, C₆H₅

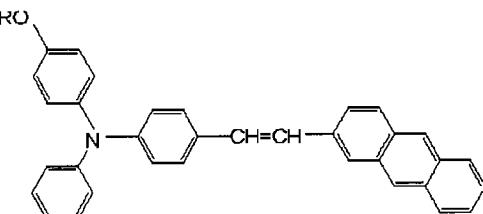
【化187】



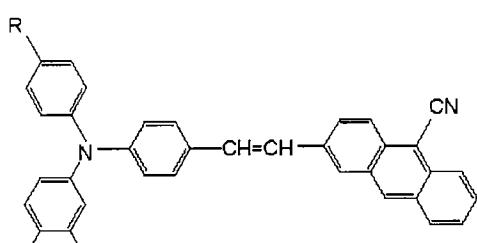
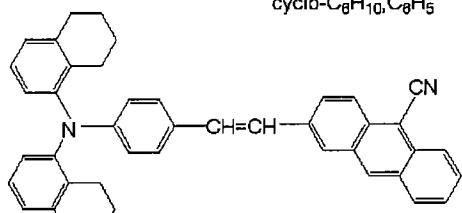
【化188】



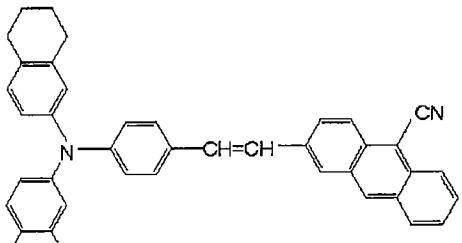
R=CH₃, C₂H₅, i-C₃H₇, t-C₄H₉,
cyclo-C₆H₁₀, C₆H₅



R=C₂H₅, i-C₃H₇, t-C₄H₉,
cyclo-C₆H₁₀, C₆H₅

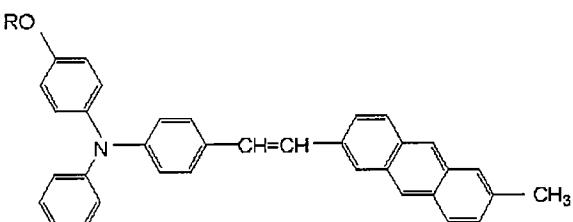


R=CH₃, C₂H₅, i-C₃H₇, t-C₄H₉,
cyclo-C₆H₁₀, C₆H₅

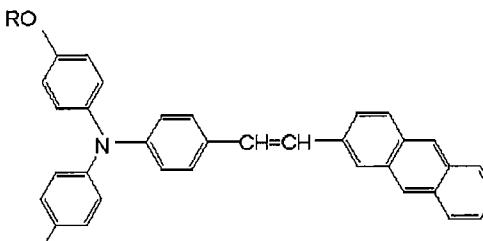


R=C₂H₅, i-C₃H₇, t-C₄H₉,
cyclo-C₆H₁₀, C₆H₅

【化189】

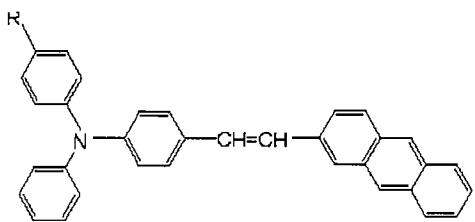


R=CH₃, C₂H₅, i-C₃H₇, t-C₄H₉,
cyclo-C₆H₁₀, C₆H₅

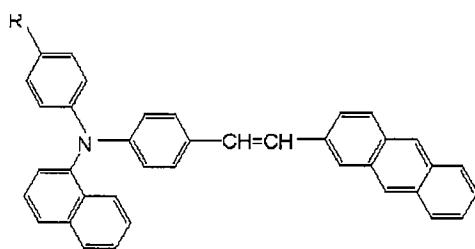


R=CH₃, C₂H₅, i-C₃H₇, t-C₄H₉,
cyclo-C₆H₁₀, C₆H₅

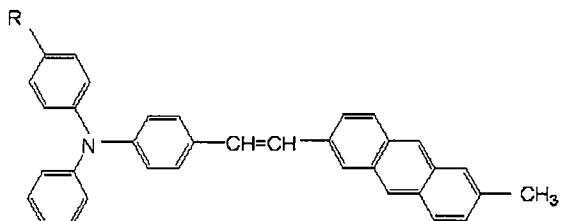
【化190】



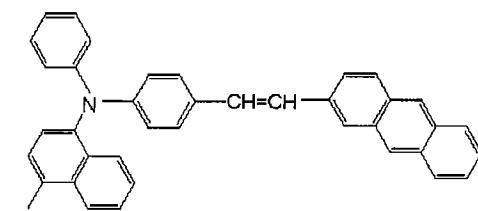
R=C₂H₅, i-C₃H₇, i-C₄H₉, t-C₄H₉,
cyclo-C₆H₁₀, C₆H₅



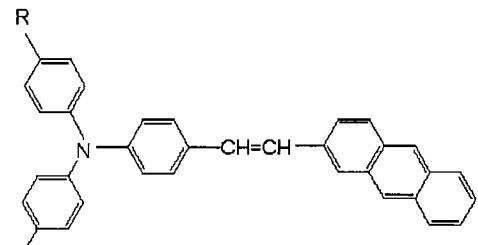
R=C₂H₅, i-C₃H₇, i-C₄H₉, t-C₄H₉,
cyclo-C₆H₁₀, C₆H₅



R=CH₃, C₂H₅, i-C₃H₇, i-C₄H₉, t-C₄H₉,
cyclo-C₆H₁₀, C₆H₅

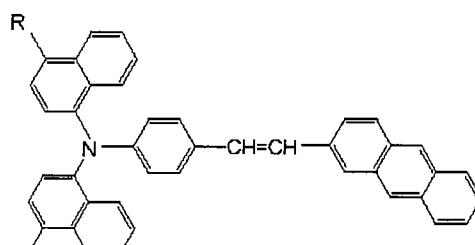


R=CH₃, C₂H₅, i-C₃H₇, i-C₄H₉, t-C₄H₉,
cyclo-C₆H₁₀, C₆H₅



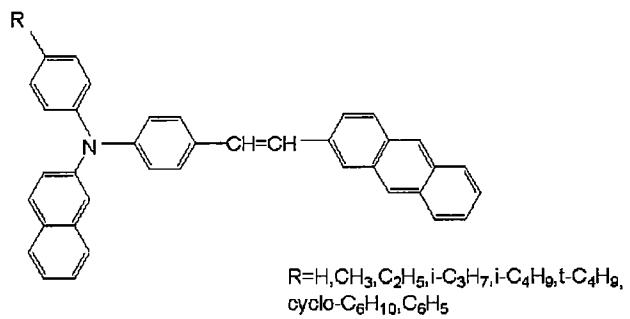
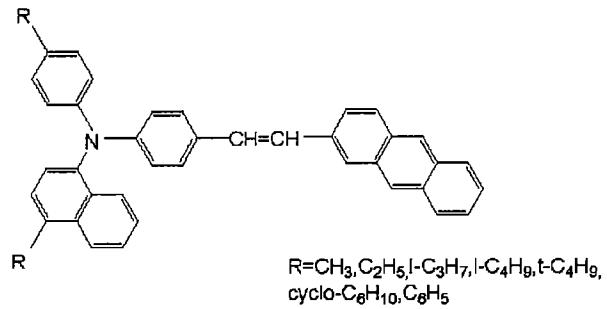
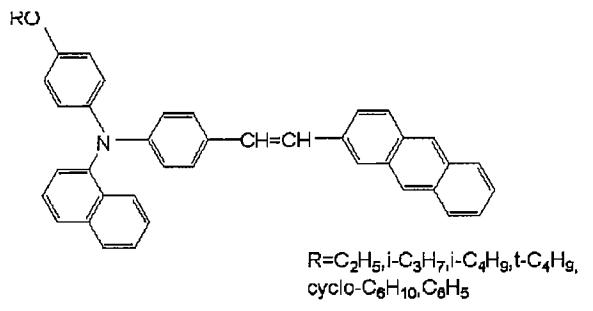
R=C₂H₅, i-C₃H₇, i-C₄H₉, t-C₄H₉,
cyclo-C₆H₁₀, C₆H₅

【化191】

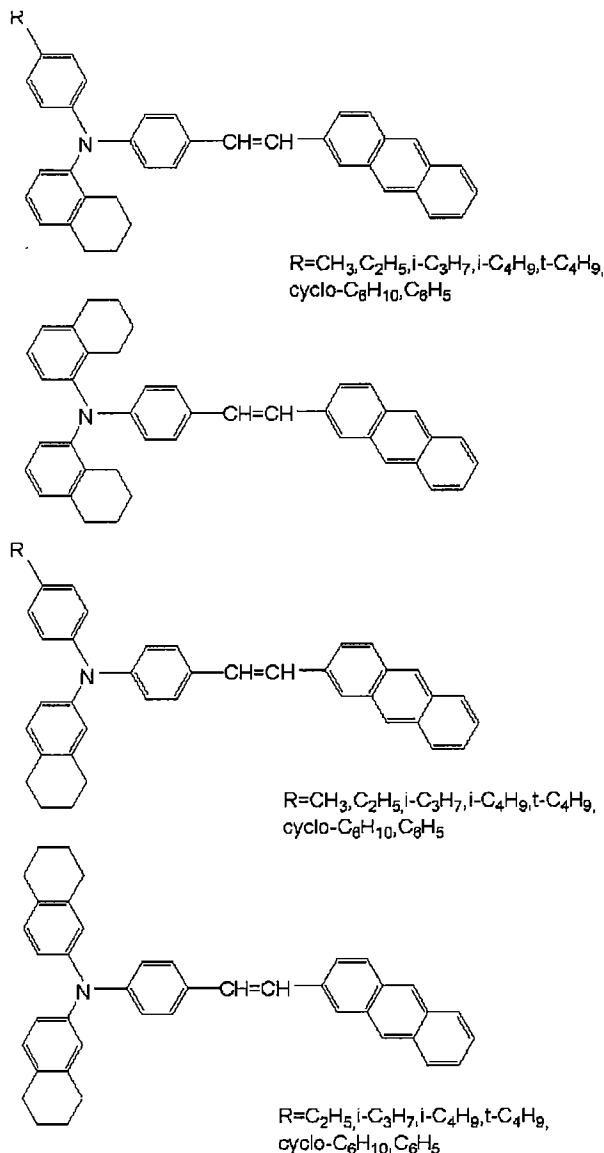


R=CH₃, C₂H₅, i-C₃H₇, i-C₄H₉, t-C₄H₉,
cyclo-C₆H₁₀, C₆H₅

【化192】



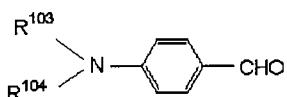
【化193】



【0020】本発明はまた、本発明の化合物を高効率に製造する方法として、下記一般式〔V〕で表わされるアミノベンズアルデヒドと；下記一般式〔VI〕で表わされるホスホン酸エステル又は下記一般式〔VII〕で表わされるホスホニウム塩と；を縮合させることによって、前記一般式〔I〕、〔II〕、〔III〕又は〔IV〕で示されるアミノスチリルアントラセン化合物を得る、本発明の製造方法も提供するものである。

【化194】

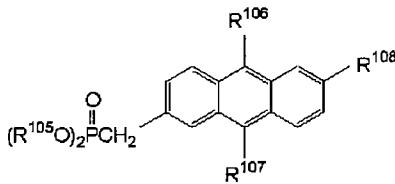
一般式〔V〕：



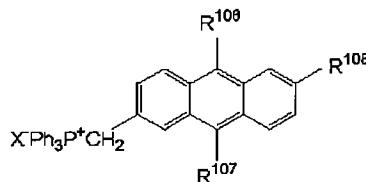
(但し、前記一般式〔V〕において、R¹⁰³及びR¹⁰⁴はそれぞれ、前記R¹、R²、R¹¹、R¹²、R²¹、R²²、R³⁸又はR³⁹に相当する基である。)

【化195】

一般式〔VI〕：



一般式〔VII〕：



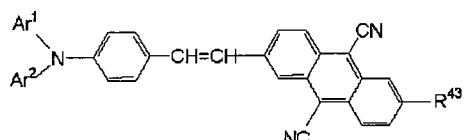
(但し、前記一般式〔VI〕及び〔VII〕において、R¹⁰⁵は炭化水素基（好ましくは炭素数1～4の飽和炭化水素基）であり、R¹⁰⁶及びR¹⁰⁷はそれぞれ、前記R³、R⁴、R¹³、R¹⁴、R²³、R²⁴、R⁴⁰又はR⁴¹に相当する基であり、R¹⁰⁸は前記R⁵、R¹⁶、R²⁵又はR⁴²に相当する基であり、Xはハロゲン原子である。)

【0021】本発明の化合物の製造方法は、具体的には、前記縮合をウイッティヒー・ホーナー（Wittig-Horner）反応又はウイッティヒ（Wittig）反応によって行い、前記ホスホン酸エステル及び／又は前記ホスホニウム塩を溶媒中で塩基で処理することによってカルボアニオンを生成させ、このカルボアニオンと前記アミノベンズアルデヒドとを縮合させるものである。

【0022】例えば、下記一般式〔5〕で表わされるアミノスチリルアントラセン化合物を得るに際し

【化196】

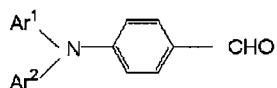
一般式〔5〕：



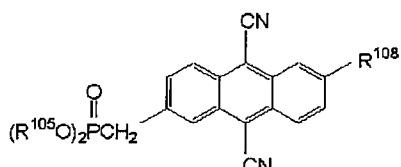
(但し、前記一般式〔5〕において、Ar¹、Ar²およびR⁴³はそれぞれ、前記したものと同じである。)、下記一般式〔38〕で表わされる4-(N,N-ジアリールアミノ)ベンズアルデヒドと；下記一般式〔39〕で表わされるホスホン酸エステル又は下記一般式〔40〕で表わされるホスホニウム塩と；を縮合させる。

【化197】

一般式(38) :



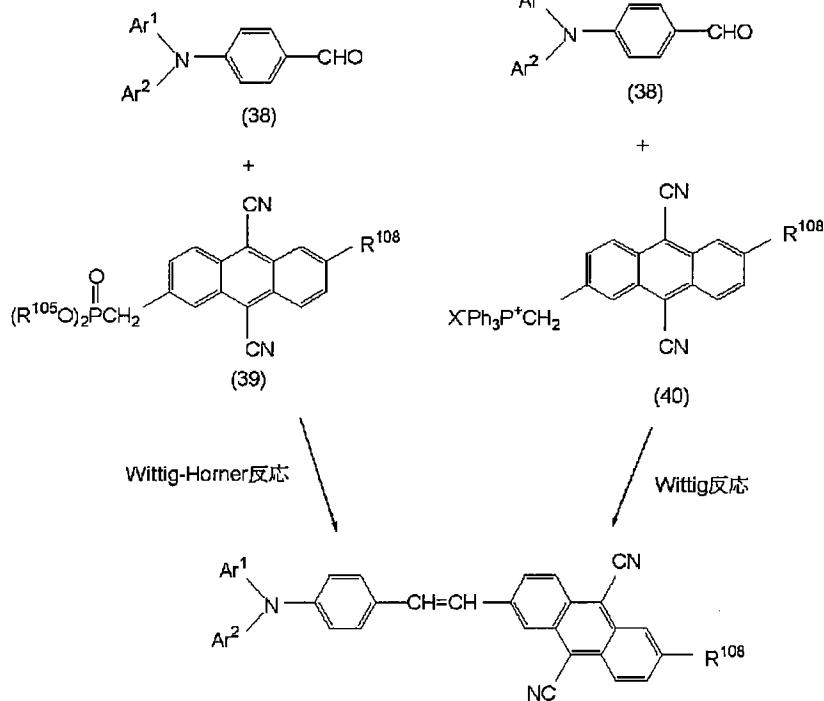
一般式(39) :



一般式(40) :



反応スキーム1 :



【0024】この反応はまず、一般式(39)又は(40)の化合物を適当な溶媒中で塩基と処理することにより、カルボアニオンを発生させることから始まり、次にこのカルボアニオンを一般式(38)のアルデヒドと縮合することにより完結する。塩基と溶媒の組み合せとしては、以下のものが考えられる。

【0025】水酸化ナトリウム／水、炭酸ナトリウム／水、炭酸カリウム／水、ナトリウムエトキシド／エタノール／又はジメチルホルムアミド、ナトリウムメトキシド／メタノール－ジエチルエーテル混合溶媒又はジメチルホルムアミド、トリエチルアミン／エタノール又はジ

(但し、前記一般式(38)、(39)及び(40)において、Ar¹、Ar²、R¹⁰⁵及びXは前記したものと同じである。)

【0023】この反応をスキームで表すと、例えば反応スキーム1のようになる。

【化198】

／塩化メチレン又はニトロメタン、1，5-ジサザビシクロ[4.3.0]ノン-5-エン／ジメチルスルホキシド、カリウムt-ブトキシド／ジメチルスルホキシド又はテトラヒドロフラン又はベンゼン又はジメチルホルムアミド、フェニルリチウム／ジエチルエーテル又はテトラヒドロフラン、t-ブチルリチウム／ジエチルエーテル又はテトラヒドロフラン、ナトリウムアミド／アンモニア、水素化ナトリウム／ジメチルホルムアミド又はテトラヒドロフラン、トリエチルナトリウム／ジエチルエーテル又はテトラヒドロフラン等。

【0026】この反応は比較的低温(-30°C~30

による目的物の精製が容易であることに加え、一般式(5)の本発明の化合物は結晶性が高いため再結晶により純度を向上させることができる。再結晶の方法については、特に問わないが、アセトンに溶解し、ヘキサンを添加する方法、あるいはトルエンに加熱溶解し、濃縮、冷却する方法が簡便である。この反応は常圧で3~24時間で行ってよい。

【0027】本発明の化合物の製造方法によって、前記一般式(12)、(13)、(14)、(15)、(16)、(17)、(18)、(21)、(22)、(23)、(24)、(25)、(26)、(27)、(30)、(31)、(32)、(33)、(34)、(35)又は(36)で表わされるアミノスチリルアントラセン化合物を得ることができ、具体的には前記構造式(19)-1、(19)-2、(19)-3、(19)-4、(19)-5、(19)-6、(19)-7、(19)-8、(19)-9、(19)-10、(19)-11、(19)-12、(28)-1、(28)-2、(28)-3、(28)-4、(28)-5、(28)-6、(28)-7、(28)-8、(28)-9、(28)-10、(28)-11、(28)-12、(37)-1、(37)-2、(37)-3、(37)-4、(37)-5、(37)-6、(37)-7、(37)-8、(37)-9、(37)-10、(37)-11又は(37)-12で表わされるアミノスチリルアントラセン化合物を得ることができる。

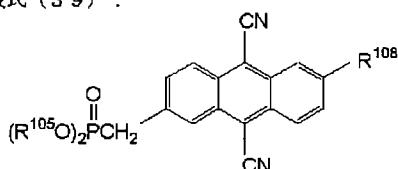
【0028】本発明はまた、本発明の化合物の合成中間体として好適な種々の化合物も提供するものである。

【0029】即ち、前記一般式[I]、[II]、[II-I]又は[IV]で表わされるアミノスチリルアントラセン化合物の合成中間体として用いられる前記一般式[V]で表わされるホスホン酸エステル、又は前記一般式[VII]で表わされるホスホニウム塩である。

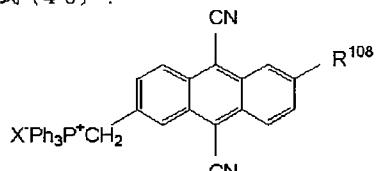
【0030】この合成中間体（以下、本発明の合成中間体1と称する。）は、具体的には下記一般式(39)、(40)、(41)、(42)、(43)又は(44)で表わされる。

【化199】

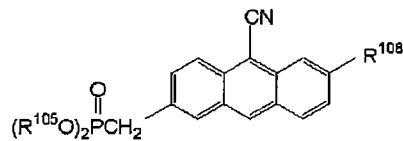
一般式(39)：



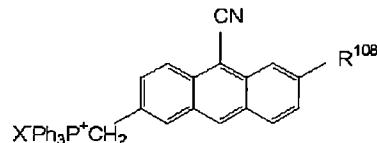
一般式(40)：



一般式(41)：

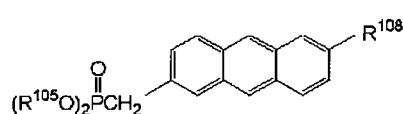


一般式(42)：

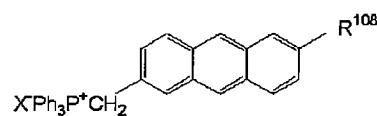


【化201】

一般式(43)：



一般式(44)：

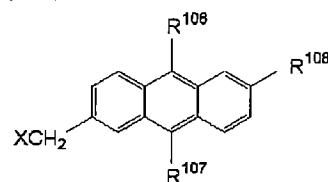


【0031】本発明の合成中間体は、その前駆体としての合成中間体から次のようにして導くことができる。

【0032】下記一般式[VIII]で表わされるハロゲン化アリール化合物と、下記一般式[IX]で表わされる亜りん酸トリアルキル又はトリフェニルホスフィン(PPh₃)とを反応させることによって、前記一般式[VI]で表わされるホスホン酸エステル、又は前記一般式[VI-I]で表わされるホスホニウム塩を合成中間体として得る。この反応は、無溶媒又は120℃以上の沸点を有するキシレン等の溶媒中、又は大過剰の亜りん酸トリアルキル中で、反応温度120℃~160℃、常圧で反応時間30分~24時間としてよい。

【化202】

一般式[VIII]：



（但し、前記一般式[VIII]において、R¹⁰⁶及びR¹⁰⁷は互いに同一の若しくは異なる基であって、それらの少なくとも一つが水素原子、シアノ基、ニトロ基又はハロゲン原子であり、R¹⁰⁸は水素原子、炭素数1以上（好ましくは1~6）の飽和若しくは不飽和の炭化水素基、又は置換基を有してもよいアリール基であり、Xはハロゲン原子である。）

一般式[IX]：

P(O R¹⁰⁵)₃

基、特に炭素数1～4の飽和炭化水素基である。)

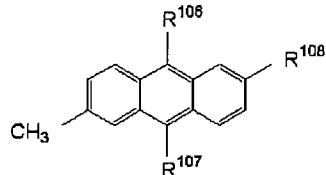
【0033】本発明はまた、合成中間体1を得るための合成中間体として、前記一般式〔VIII〕で表わされるハロゲン化アリール化合物（以下、本発明の合成中間体2と称する。）も提供するものである。

【0034】本発明の合成中間体2は、下記一般式〔X〕で表わされるアントラセン化合物と、下記一般式〔XI〕で表わされるN-ハロゲン化スクシンイミドとを光照射下に反応させることによって得ることができる。例えば、四塩化炭素、クロロホルム、ベンゼン、クロロベンゼン等の溶媒中、高圧水銀灯、低圧水銀灯、キセノン灯、ハロゲン灯、日光、蛍光灯等の光源を用いて20～120℃の温度、常圧で30～48時間の反応時間で反応させる。

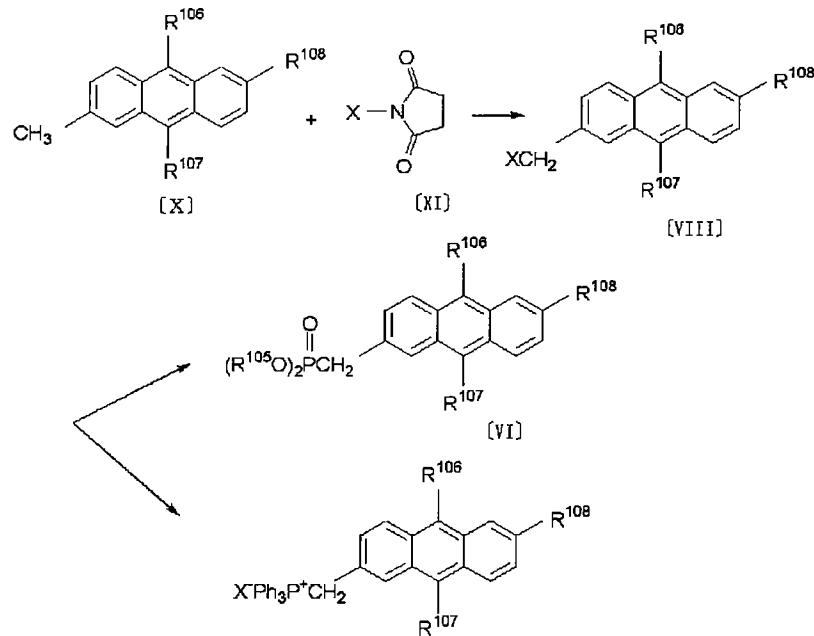
【0035】

【化203】

一般式〔X〕：



反応スキーム2：



【0039】図10～図13は、本発明の化合物を有機発光材料として用いる有機電界発光素子（EL素子）の例をそれぞれ示すものである。

【0040】図10は陰極3を発光光20が透過する透過型有機電界発光素子Aであって、発光光20は保護層4の側からも観測できる。図11は陰極3での反射光も発光光20として得る反射型有機電界発光素子Bを示す。

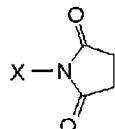
【0041】図中、1は有機電界発光素子を形成するた

（但し、一般式〔X〕において、R106及びR107は互いに同一の若しくは異なる基であって、それらの少なくとも一つが水素原子、シアノ基、ニトロ基又はハロゲン原子であり、R108は水素原子、炭素数1以上（好ましくは1～6）の飽和若しくは不飽和の炭化水素基、又は置換基を有してもよいアリール基である。）

【0036】

【化204】

一般式〔XI〕：



（但し、前記一般式〔XI〕において、Xはハロゲン原子である。）

【0037】以上に述べた各合成中間体1、2をそれぞれ得る反応は、例えば次の反応スキーム2で示すことができる。

【0038】

【化205】

【VII】材料を用いることができる。また、有機電界発光素子他の表示素子と組み合せて用いる場合には、基板を共用することもできる。2は透明電極（陽極）であり、ITO（Indium tin oxide）、SnO₂等を使用できる。

【0042】また、5は有機発光層であり、本発明の化合物を発光材料として含有している。この発光層について、有機電界発光20を得る層構成としては、従来公知の種々の構成を用いることができる。後述するように、例えば、正孔輸送層と電子輸送層のいずれかを構成する

造を使用できる。更に本発明の目的を満たす範囲で電荷輸送性能を上げるために、正孔輸送層と電子輸送層のいずれか若しくは両方が、複数種の材料の薄膜を積層した構造、または、複数種の材料を混合した組成からなる薄膜を使用するのを妨げない。また、発光性能を上げるために、少なくとも1種以上の蛍光性の材料を用いて、この薄膜を正孔輸送層と電子輸送層の間に挟持した構造、更に少なくとも1種以上の蛍光性の材料を正孔輸送層若しくは電子輸送層、またはこれらの両方に含ませた構造を使用しても良い。これらの場合には、発光効率を改善するために、正孔または電子の輸送を制御するための薄膜をその層構成に含ませることも可能である。

【0043】本発明の化合物は、電子輸送性能と正孔輸送性能の両方を持つため、素子構成中、電子輸送層を兼ねた発光層としても、或いは正孔輸送層を兼ねた発光層としても用いることが可能である。また、本発明の化合物を発光層として、電子輸送層と正孔輸送層とで挟み込んだ構成とすることも可能である。

【0044】なお、図10及び図11中、3は陰極であり、電極材料としては、Li、Mg、Ca等の活性な金属とAg、Al、In等の金属との合金、或いはこれらを積層した構造を使用できる。透過型の有機電界発光素子においては、陰極の厚さを調節することにより、用途に合った光透過率を得ることができる。また、図中の4は封止・保護層であり、有機電界発光素子全体を覆う構造とすることにより、その効果が上がる。気密性が保たれれば、適宜の材料を使用することができる。また、8は電流注入用の駆動電源である。

【0045】本発明に基づく有機電界発光素子において、有機層が、正孔輸送層と電子輸送層とが積層された有機積層構造（シングルヘテロ構造）を有しており、正孔輸送層又は電子輸送層の形成材料として本発明の化合物が用いられてよい。或いは、有機層が、正孔輸送層と発光層と電子輸送層とが順次積層された有機積層構造（ダブルヘテロ構造）を有しており、発光層の形成材料として本発明の化合物が用いられてよい。

【0046】このような有機積層構造を有する有機電界発光素子の例を示すと、図3は、透光性の基板1上に、透光性の陽極2と、正孔輸送層6と電子輸送層7とからなる有機層5aと、陰極3とが順次積層された積層構造を有し、この積層構造が保護膜4によって封止されてなる、シングルヘテロ構造の有機電界発光素子Cである。

【0047】図12に示すように発光層を省略した層構成の場合には、正孔輸送層6と電子輸送層7の界面から所定波長の発光光20を発生する。これらの発光光は基板1側から観測される。

【0048】また、図13は、透光性の基板1上に、透光性の陽極2と、正孔輸送層10と発光層11と電子輸送層12とからなる有機層5bと、陰極3とが順次積層

て封止されてなる、ダブルヘテロ構造の有機電界発光素子Dである。

【0049】図13に示した有機電界発光素子においては、陽極2と陰極3の間に直流電圧を印加することにより、陽極2から注入された正孔が正孔輸送層10を経て、また陰極3から注入された電子が電子輸送層12を経て、それぞれ発光層11に到達する。この結果、発光層11においては電子／正孔の再結合が生じて一重項励起子が生成し、この一重項励起子から所定波長の発光を発生する。

【0050】上述した各有機電界発光素子C、Dにおいて、基板1は、例えば、ガラス、プラスチック等の光透過性の材料を適宜用いることができる。また、他の表示素子と組み合せて用いる場合や、図12及び図13に示した積層構造をマトリックス状に配置する場合等は、この基板を共用としてよい。また、素子C、Dはいずれも、透過型、反射型のいずれの構造も採りうる。

【0051】また、陽極2は、透明電極であり、ITO(indium tin oxide)やSnO₂等が使用できる。この陽極2と正孔輸送層6（又は正孔輸送層10）との間には、電荷の注入効率を改善する目的で、有機物若しくは有機金属化合物からなる薄膜を設けてもよい。なお、保護膜4が金属等の導電性材料で形成されている場合は、陽極2の側面に絶縁膜が設けられていてもよい。

【0052】また、有機電界発光素子Cにおける有機層5aは、正孔輸送層6と電子輸送層7とが積層された有機層であり、これらのいずれか又は双方に本発明の化合物が含有され、発光性の正孔輸送層6又は電子輸送層7としてよい。有機電界発光素子Dにおける有機層5bは、正孔輸送層10と本発明の化合物を含有する発光層11と電子輸送層12とが積層された有機層であるが、その他、種々の積層構造を取ることができる。例えば、正孔輸送層と電子輸送層のいずれか若しくは両方が発光性を有していてもよい。

【0053】また、特に、正孔輸送層6又は電子輸送層7や発光層11が本発明の化合物からなる層であることが望ましいが、これらの層を本発明の化合物のみで形成してもよく、或いは、本発明の化合物と他の正孔又は電子輸送材料（例えば、芳香族アミン類やピラゾリン類等）との共蒸着によって形成してもよい。さらに、正孔輸送層において、正孔輸送性能を向上させるために、複数種の正孔輸送材料を積層した正孔輸送層を形成してもよい。

【0054】また、有機電界発光素子Cにおいて、発光層は電子輸送性発光層7であってよいが、電源8から印加される電圧によっては、正孔輸送層6やその界面で発光される場合がある。同様に、有機電界発光素子Dにおいて、発光層は層11以外に、電子輸送層12であってもよく、正孔輸送層10であってもよい。発光性能を向

発光層 1 1 を正孔輸送層と電子輸送層との間に挟持させた構造であるのがよい。または、この蛍光性材料を正孔輸送層又は電子輸送層、或いはこれら両層に含有させた構造を構成してよい。このような場合、発光効率を改善するために、正孔又は電子の輸送を制御するための薄膜

(ホールブロッキング層やエキシトン生成層など) をその層構成に含ませることも可能である。

【0055】また、陰極 3 に用いる材料としては、Li、Mg、Ca 等の活性な金属と Ag、Al、In 等の金属との合金を使用でき、これらの金属層が積層した構造であってもよい。なお、陰極の厚みや材質を適宜選択することによって、用途に見合った有機電界発光素子を作製できる。

【0056】また、保護膜 4 は、封止膜として作用するものであり、有機電界発光素子全体を覆う構造として、電荷注入効率や発光効率を向上できる。なお、その気密性が保たれれば、アルミニウム、金、クロム等の単金属又は合金など、適宜その材料を選択できる。

【0057】上記した各有機電界発光素子に印加する電流は通常、直流であるが、パルス電流や交流を用いてもよい。電流値、電圧値は、素子破壊しない範囲内であれば特に制限はないが、有機電界発光素子の消費電力や寿命を考慮すると、なるべく小さい電気エネルギーで効率良く発光させることが望ましい。

【0058】次に、図 1 4 は、本発明の有機電界発光素子を用いた平面ディスプレイの構成例である。図示の如く、例えばフルカラーディスプレイの場合は、赤

(R)、緑(G)及び青(B)の3原色を発光可能な有機層 5 (5a、5b) が、陰極 3 と陽極 2 との間に配されている。陰極 3 及び陽極 2 は、互いに交差するストラ

イプ状に設けることができ、輝度信号回路 1 4 及びシフトレジスタ内蔵の制御回路 1 5 により選択されて、それぞれに信号電圧が印加され、これによって、選択された陰極 3 及び陽極 2 が交差する位置(画素)の有機層が発光するように構成される。

【0059】即ち、図 1 4 は例えば 8 × 3 RGB 単純マトリックスであって、正孔輸送層と、発光層および電子輸送層のいずれか少なくとも一方とからなる積層体 5 を陰極 3 と陽極 2 の間に配置したものである(図 1 2 又は図 1 3 参照)。陰極と陽極は、ともにストライプ状にパターニングするとともに、互いにマトリクス状に直交させ、シフトレジスタ内蔵の制御回路 1 5 および 1 4 により時系列的に信号電圧を印加し、その交叉位置で発光するように構成されたものである。かかる構成の EL 素子は、文字・記号等のディスプレイとしては勿論、画像再生装置としても使用できる。また陰極 3 と陽極 2 のストライプ状パターンを赤(R)、緑(G)、青(B)の各色毎に配し、マルチカラーあるいはフルカラーの全固体型フラットパネルディスプレイを構成することが可能となる。

【0060】

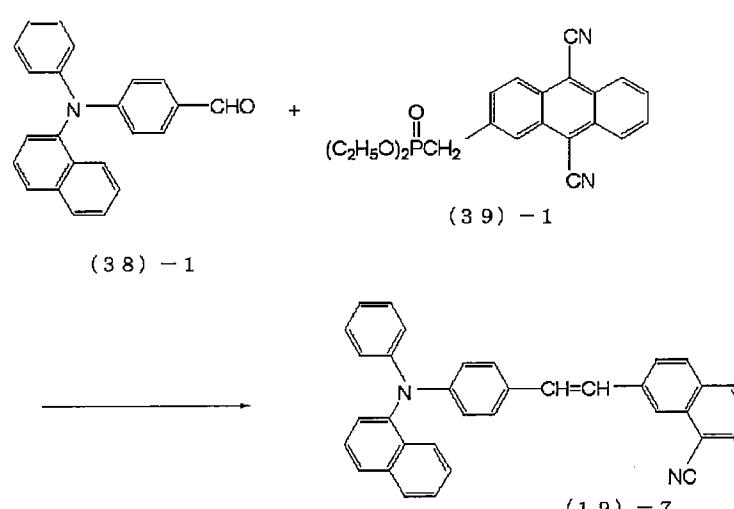
【実施例】以下、本発明を実施例について具体的に説明するが、本発明は以下の実施例に限定されるものではない。

【0061】実施例 1

<アミノスチリルアントラセン化合物(構造式(19)-7)の合成例>

【0062】

【化 206】



【0063】反応容器に水素化ナトリウム(ミネラルオイル入り)3.75 mmol を計り取り、窒素雰囲気下で無水テトラヒドロフラン 5 mL に懸濁させた。室温で攪拌しながら、ホスホン酸エステル((39)-1) 4.71 mg (1.24 mmol) と 4-[N-(1-ナフチル)-N-フェニルアミノ]ベンズアルデヒド((3)

テトラヒドロフラン及び無水ジメチルホルムアミドの 6 : 1 混合溶液 7.0 mL を滴下し、室温で 12 時間攪拌した。反応混合液を少量の氷でクエンチし、飽和食塩水で洗い、無水硫酸ナトリウムで乾燥した。反応溶液を濃縮し、水を添加することによって生じた沈殿物を水、エタノール及びヘキサンで洗った。

—g e l C—300, トルエン)により精製し、トルエンから再結晶することにより、赤色結晶383mgを得た。これは、¹H NMR及びFAB—MS測定により、目的物((19)—7)と同定した(收率56%)。この分析データは次の通りであった。

¹H NMR(CDCI₃) δ(ppm): 6.99–7.54(15H,m), 7.79–7.95(4H,m), 8.08(2H,d), 8.34(1H,s), 8.42–8.50(3H,m)

ガラス転移点は137°C、融点は312°Cであった。

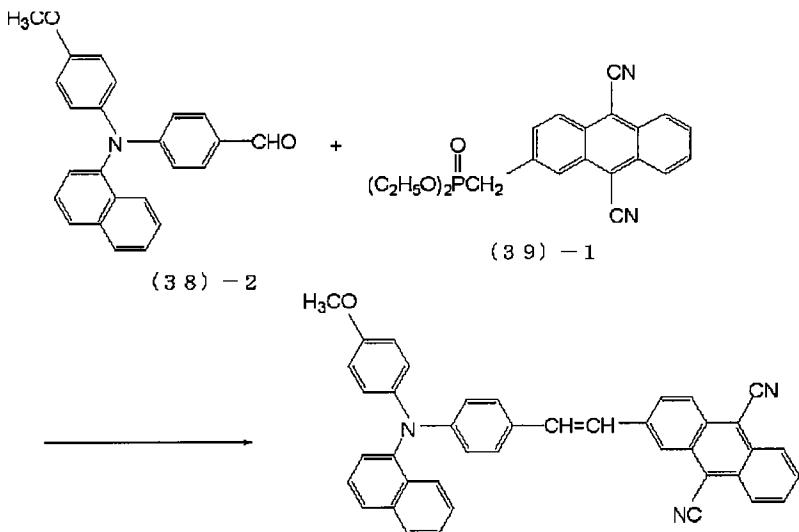
【0065】この目的物のトルエン溶液の可視吸収極大は511nm、蛍光極大波長は615nmであった。また、その¹H NMRスペクトルは図1に示す通りであった。

【0066】実施例2

<アミノスチリルアントラセン化合物((19)—8)の合成例>

【0067】

【化207】



【0068】反応容器に水素化ナトリウム(ミネラルオイル入り)3.75mmolを計り取り、窒素雰囲気下で無水テトラヒドロフラン5mLに懸濁させた。室温で攪拌しながら、ホスホン酸エステル((39)-1)4.71mg(1.24mmol)と4-[N-(4-メトキシフェニル)-N-(1-ナフチル)アミノ]ベンズアルデヒド((38)-2)521mg(1.47mmol)との、無水テトラヒドロフラン及び無水ジメチルホルムアミドの6:1混合溶液70mLを滴下し、室温で12時間攪拌した。反応混合液を少量の氷でクエンチし、飽和食塩水で洗い、無水硫酸ナトリウムで乾燥した。反応溶液を濃縮し、水を添加することによって生じた沈殿物を水、エタノール及びヘキサンで洗った。

【0069】シリカゲルクロマトグラフィー(WAKO—g e l C—300, トルエン)により精製し、トルエンから再結晶することにより、赤色結晶417mgを

得た。これは、¹H NMR及びFAB—MS測定により、目的物((19)—8)と同定した(收率34%)。この分析データは次の通りであった。

¹H NMR(CDCI₃) δ(ppm): 3.80(3H,s), 6.86(4H,d), 7.14–7.53(1H,d), 7.81(3H,m), 7.90–7.98(2H,m), 8.07(2H,d), 8.31(1H,s), 8.40–8.48(3H,m)

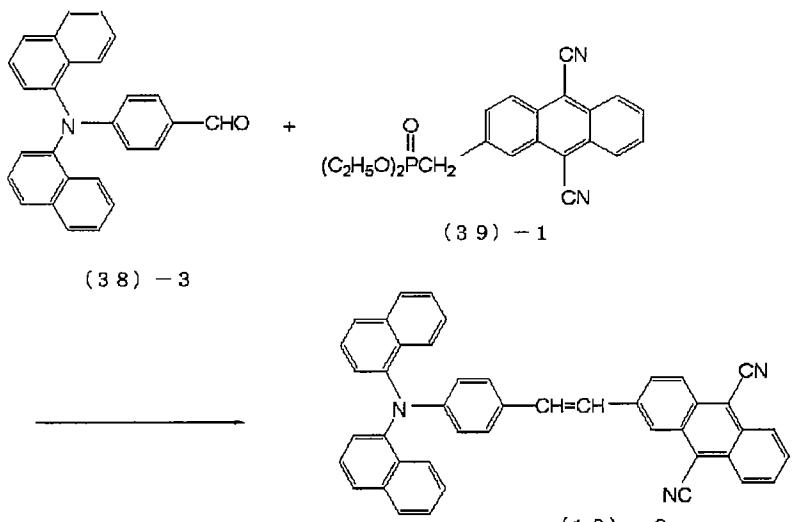
【0070】この目的物のトルエン溶液の可視吸収極大は527nm、蛍光極大波長は640nmであった。また、その¹H NMRスペクトルは図2に示す通りであった。

【0071】実施例3

<アミノスチリルアントラセン化合物((19)—9)の合成例>

【0072】

【化208】



【0073】反応容器に水素化ナトリウム（ミネラルオイル入り）7. 50 mmolを計り取り、窒素雰囲気下で無水テトラヒドロフラン10 mLに懸濁させた。室温で攪拌しながら、ホスホン酸エステル（（39）-1）500 mg（1.32 mmol）と4-[N,N-ジ（1-ナフチル）アミノ]ベンズアルデヒド（（38）-3）758 mg（2.03 mmol）との、無水テトラヒドロフラン及び無水ジメチルホルムアミドの3：1混合溶液70 mLを滴下し、室温で12時間攪拌した。反応混合液を少量の氷でクエンチし、飽和食塩水で洗い、無水硫酸ナトリウムで乾燥した。反応溶液を濃縮し、水を添加することによって生じた沈殿物を水、エタノール及びヘキサンで洗った。

【0074】シリカゲルクロマトグラフィー（WAKO-gel C-300,トルエン）により精製し、トルエンから再結晶することにより、赤色結晶443 mgを

得た。これは、¹H NMR及びFAB-MS測定により、目的物（（19）-9）と同定した（収率55%）。この分析データは次の通りであった。

¹H NMR (CDCl₃) δ (ppm) : 6.70(2H,d), 7.15-7.50(12H,m), 7.74-7.82(4H,m), 7.92(2H,m), 8.06(3H,m), 8.31(1H,s), 8.41-8.49(3H,s)

ガラス転移点は165°C、融点は314°Cであった。

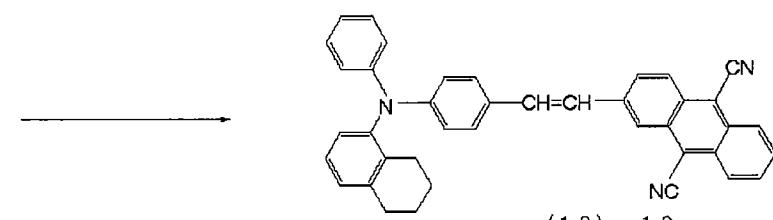
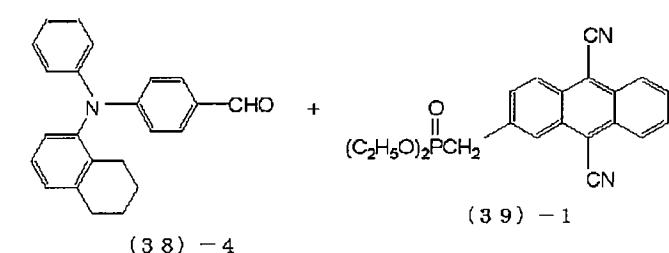
【0075】この目的物のトルエン溶液の可視吸収極大は514 nm、蛍光極大波長は610 nmであった。また、その¹H NMRスペクトルは図3に示す通りであった。

【0076】実施例4

<アミノスチリルアントラセン化合物（（19）-10）の合成例>

【0077】

【化209】



【0078】反応容器に水素化ナトリウム（ミネラルオイル入り）1.56 mmolを計り取り、窒素雰囲気下で無水テトラヒドロフラン5 mLに懸濁させた。冰冷下で攪拌しながら、ホスホン酸エ斯特ル（（39）-1）200 mg（0.53 mmol）と4-[N-フェニル-N-（5,6,7,8-テトラヒドロ-1-ナフチル

g（0.63 mmol）との、無水テトラヒドロフラン及び無水ジメチルホルムアミドの4：1混合溶液40 mLを滴下し、冰冷下で3時間、更に室温で12時間攪拌した。反応混合液を少量の氷でクエンチし、飽和食塩水で洗い、無水硫酸ナトリウムで乾燥した。反応溶液を濃縮し、水を添加することによって生じた沈殿物を水、エ

【0079】シリカゲルクロマトグラフィー (WAKO - g e l C-300, トルエン) により精製し、トルエンから再結晶することにより、赤褐色結晶 196 mg を得た。これは、¹H NMR 及び FAB-MS 測定により、目的物 ((19)-10) と同定した (収率 56 %)。この分析データは次の通りであった。

¹H NMR (CDCl₃) δ (ppm) : 1.72(4H,m), 2.40(2H,m), 2.84(2H,m), 6.94-7.44(12H,m), 7.46(2H,d), 7.83(2H,m), 8.08(1H,d), 8.35(1H,s), 8.42-8.50(3H,m)

融点は 309 °C であった。

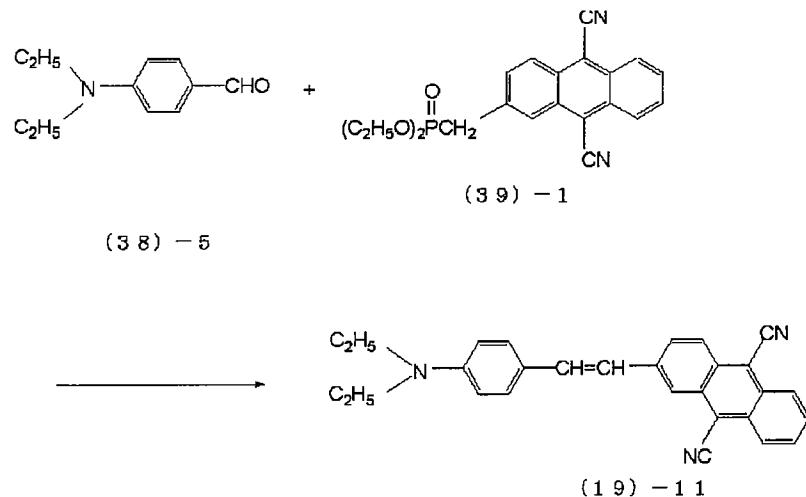
【0080】この目的物のトルエン溶液の可視吸収極大は 515 nm、蛍光極大波長は 630 nm であった。また、その¹H NMR スペクトルは図 4 に示す通りであった。

【0081】実施例 5

<アミノスチリルアントラセン化合物 ((19)-11) の合成例>

【0082】

【化210】



【0083】反応容器に水素化ナトリウム (ミネラルオイル入り) 3.75 mmol を計り取り、窒素雰囲気下で無水テトラヒドロフラン 10 mL に懸濁させた。室温で攪拌しながら、ホスホン酸エステル ((39)-1) 4.70 mg (1.24 mmol) と 4-(N,N-ジエチルアミノ) ベンズアルデヒド ((38)-5) 3.30 mg (1.86 mmol) との、無水テトラヒドロフラン及び無水ジメチルホルムアミドの 7 : 1 混合溶液 8.0 mL を滴下し、室温で 12 時間攪拌した。反応混合液を少量の氷でクエンチし、飽和食塩水で洗い、無水硫酸ナトリウムで乾燥した。

【0084】シリカゲルクロマトグラフィー (WAKO - g e l C-300, トルエン : THF = 10 : 1) により精製し、トルエンから再結晶することにより、赤褐色結晶 280 mg を得た。これは、¹H NMR 及び FAB-MS 測定により、目的物 ((19)-11) と同

定した (収率 56 %)。この分析データは次の通りであった。

¹H NMR (CDCl₃) δ (ppm) : 1.22(6H,t), 3.43(4H,q), 6.72(2H,d), 7.14(1H,d), 7.37(1H,d), 7.50(2H,d), 7.81(2H,m), 8.08(1H,d), 8.30(2H,s), 8.40-8.48(3H,m)

ガラス転移点は 109 °C、融点は 266 °C であった。

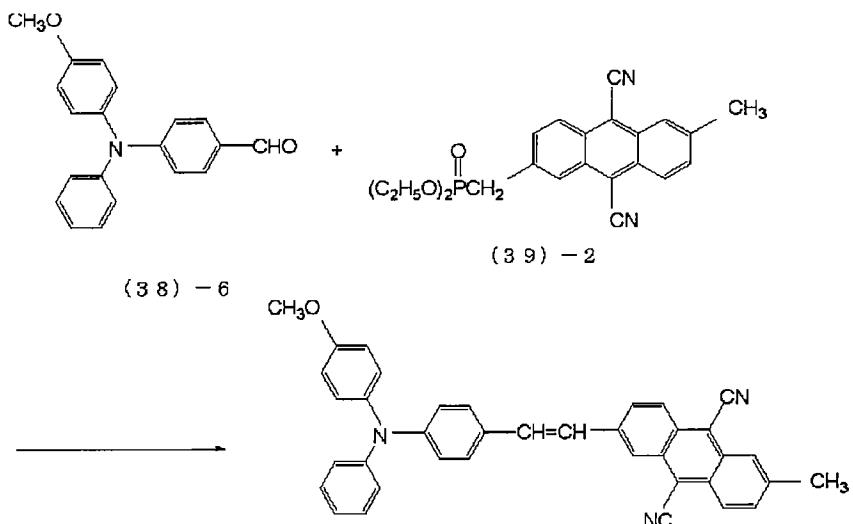
【0085】この目的物のトルエン溶液の可視吸収極大は 540 nm、蛍光極大波長は 665 nm であった。また、その¹H NMR スペクトルは図 5 に示す通りであった。

【0086】実施例 6

<アミノスチリルアントラセン化合物 ((19)-6) の合成例>

【0087】

【化211】



【0088】反応容器に水素化ナトリウム（ミネラルオイル入り）3.75 mmolを計り取り、窒素雰囲気下で無水テトラヒドロフラン10mLに懸濁させた。室温で攪拌しながら、ホスホン酸エステル（(39)-2) 470mg (1.24mmol) と4-[N-(4-メトキシフェニル)-N-フェニルアミノ]ベンズアルデヒド（(38)-6) 570mg (1.86mmol)との、無水テトラヒドロフラン及び無水ジメチルホルムアミドの1:1混合溶液120mLを滴下し、室温で12時間攪拌した。反応混合液を少量の氷でクエンチし、飽和食塩水で洗い、無水硫酸ナトリウムで乾燥した。

【0089】シリカゲルクロマトグラフィー（WAKO-gel C-300,トルエン）により精製し、トルエンから再結晶することにより、赤褐色結晶150mgを得た。これは、¹H NMR及びFAB-MS測定によ

り、目的物⁶(19)-6と同定した（収率22%）。この分析データは次の通りであった。

¹H NMR (CDCl₃) δ (ppm) : 2.67(3H,s), 3.83(3H,s), 6.87(2H,d), 6.88-7.39(5H,m), 7.45(2H,d), 7.65(1H,d), 8.05(1H,d), 8.23(1H,s), 8.33-8.43(3H,m) 融点は279°Cであった。

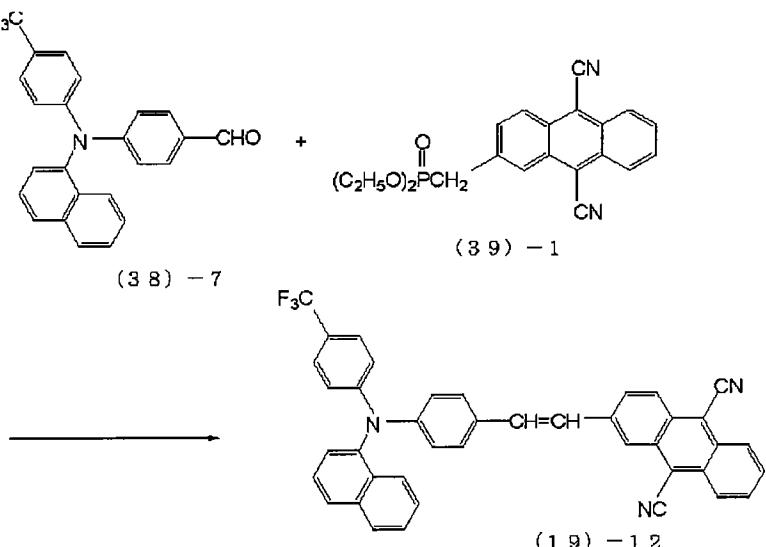
【0090】この目的物のトルエン溶液の可視吸収極大は520nm、蛍光極大波長は640nmであった。また、その¹H NMRスペクトルは図6に示す通りであった。

【0091】実施例7

<アミノスチリルアントラセン化合物（(19)-12）の合成例>

【0092】

【化212】



【0093】反応容器に水素化ナトリウム（ミネラルオイル入り）0.158g (3.96mmol) を計り取り、窒素雰囲気下で無水テトラヒドロフラン20mLに懸濁させた。氷冷下で攪拌しながら、ホスホン酸エ斯特ル（(39)-1) 200mg (0.53mmol) と4-[N,N-(1-ナフチル)-4-トリフルオロメチ

1mg (1.59mmol) との、無水テトラヒドロフラン及び無水ジメチルホルムアミドの9:1混合溶液40mLを滴下し、氷冷下で12時間攪拌した。反応混合液を少量の氷でクエンチし、トルエンで抽出して飽和食塩水で洗った後、無水硫酸ナトリウム上で乾燥した。

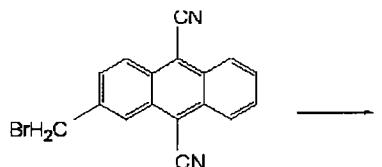
【0094】シリカゲルクロマトグラフィー（WAKO

により精製し、アセトン一ヘキサンから再結晶することにより、赤褐色結晶371mgを得た。これは、¹H NMR及びFAB-MS測定により、目的物（(19)-12）と同定した（收率46%）。この分析データは次の通りであった。

¹H NMR (CDCl₃) δ (ppm) : 7.08(2H,d), 7.15(2H,d), 7.35-7.57(10H,m), 7.80-7.89(4H,m), 7.94(1H,d), 8.07(1H,d), 8.37(1H,s), 8.44-8.50(3H,m)

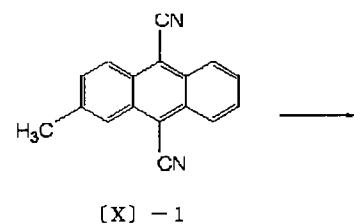
ガラス転移点は134℃、融点は303℃であった。

【0095】この目的物のトルエン溶液の可視吸収極大



【0098】2-(ブロモメチル)^[VIII]アントラセンー9,10-ジカルボニトリル（[VIII]-1）947mg (2.95mmol) をキシレン60mLに懸濁させ、亜リン酸トリブチル2.48g (14.9mmol) を滴下後、125℃で15時間攪拌した。

【0099】反応溶液を室温まで冷却し、ヘキサン100mLを添加して静置し、生じた沈殿をろ別してヘキサンで繰り返し洗い、黄色結晶942mgを得た。これは¹H NMR及びFAB-MS測定により、目的物（(39)-1）と同定した（收率84%）。この分析データ



【X】-1

【0102】2-アントラセンー9,10-ジカルボニトリル（[X]-1）800mg (3.30mmol) をクロロホルム200mLに溶解し、窒素置換した後、還流しながらN-ブロモスクシンイミド5.76g (32.4mmol) を12時間ごとに6回に分けて添加した。

【0103】反応溶液を濃縮してアルミナクロマトグラフィー（活性アルミナ300メッシュ、クロロホルム）により精製し、生じた沈殿をろ別してヘキサンで繰り返し洗い、黄色結晶947mgを得た。これは¹H NMR及びFAB-MS測定により、目的物（[VIII]-1）と同定した（收率89%）。この分析データは次の通りであった。

¹H NMR (CDCl₃) δ (ppm) : 4.75(2H,s), 7.88(3H,m), 8.47-8.55(4H,m)

¹H NMRスペクトルは図9に示す通りであった。

【0104】

【発明の作用効果】本発明の化合物は、その構造中に導

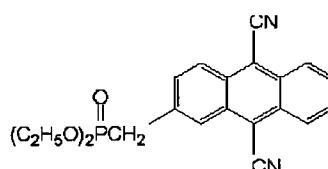
は510nm、蛍光極大波長は617nmであった（この目的物は、実施例1の化合物（(19)-7）に比べて色度が赤の標準値に近いという点で興味深い）。また、その¹H NMRスペクトルは図7に示す通りであった。

【0096】実施例8

<ホスホン酸エステル（(39)-1）の合成例>

【0097】

【化213】



は次の通りであった。

¹H NMR (CDCl₃) δ (ppm) : 1.30(6H,t), 3.47(4H,d), 4.12(8H,q), 7.85(3H,m), 8.38(1H,d), 8.51(3H,m)

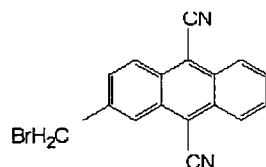
¹H NMRスペクトルは図8に示す通りであった。

【0100】実施例9

<2-(ブロモメチル)アントラセンー9,10-ジカルボニトリル（[VIII]-1）の合成例>

【0101】

【化214】



【VIII】-1

す有機発光材料として有効に利用することができ、高いガラス転移点及び融点を有する物質であり、耐熱性に優れると共に、電気的、熱的或いは化学的な安定性に優れ、また非晶質でガラス状態を容易に形成し得、昇華性もあって真空蒸着等によって均一なアモルファス膜を形成することもできる。また、本発明の化合物は、本発明の合成中間体を経て一般的かつ高効率な方法で製造することができる。

【図面の簡単な説明】

【図1】本発明の実施例1による化合物の¹H NMRスペクトル図である。

【図2】本発明の実施例2による化合物の¹H NMRスペクトル図である。

【図3】本発明の実施例3による化合物の¹H NMRスペクトル図である。

【図4】本発明の実施例4による化合物の¹H NMRスペクトル図である。

【図5】本発明の実施例5による化合物の¹H NMRス

【図6】本発明の実施例6による化合物の¹H NMRスペクトル図である。

【図7】本発明の実施例7による化合物の¹H NMRスペクトル図である。

【図8】本発明の実施例8による化合物の¹H NMRスペクトル図である。

【図9】本発明の実施例9による化合物の¹H NMRスペクトル図である。

【図10】本発明に基づく有機電界発光素子の要部概略断面図である。

【図11】同、他の有機電界発光素子の要部概略断面図である。

【図12】同、他の有機電界発光素子の要部概略断面図

である。

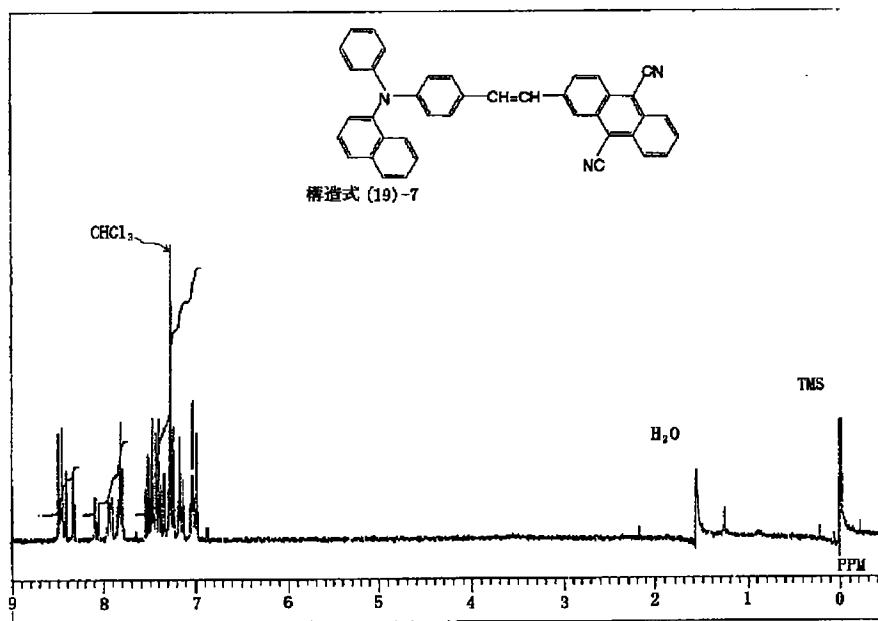
【図13】同、更に他の有機電界発光素子の要部概略断面図である。

【図14】同、有機電界発光素子を用いたフルカラーの平面ディスプレイの構成図である。

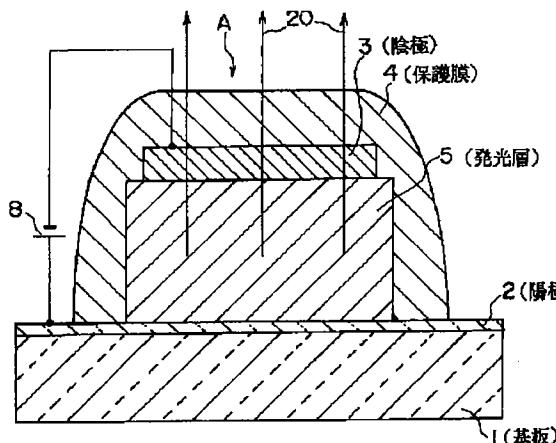
【符号の説明】

1…基板、2…透明電極（陽極）、3…陰極、4…保護膜、5、5a、5b…有機層、6…正孔輸送層、7…電子輸送層、8…電源、10…正孔輸送層、11…発光層、12…電子輸送層、14…輝度信号回路、15…制御回路、20…発光光、A、B、C、D…有機電界発光素子

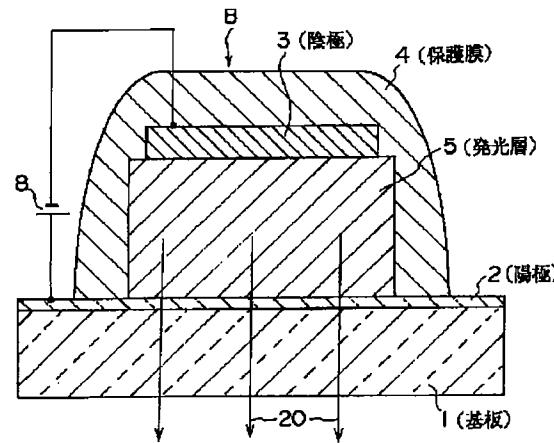
【図1】



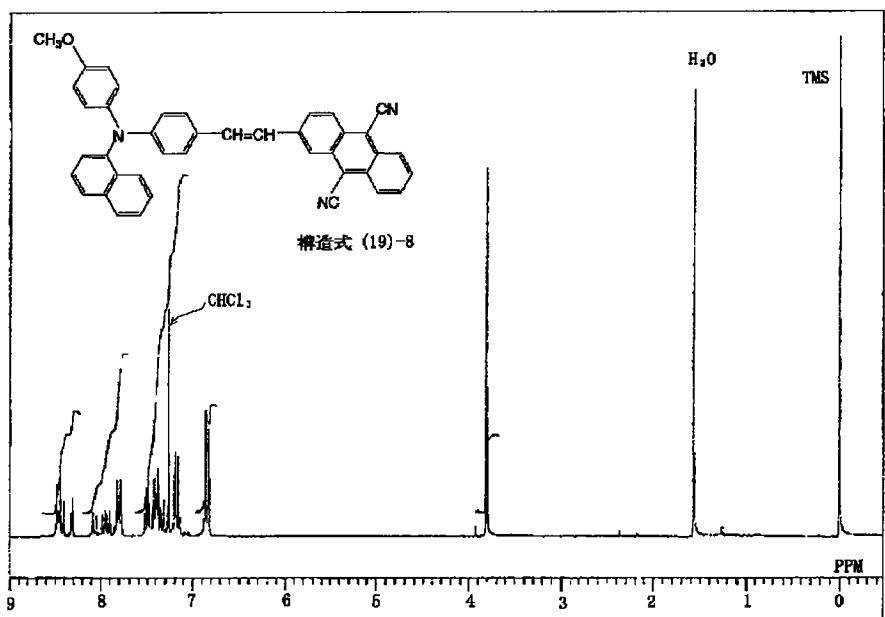
【図10】



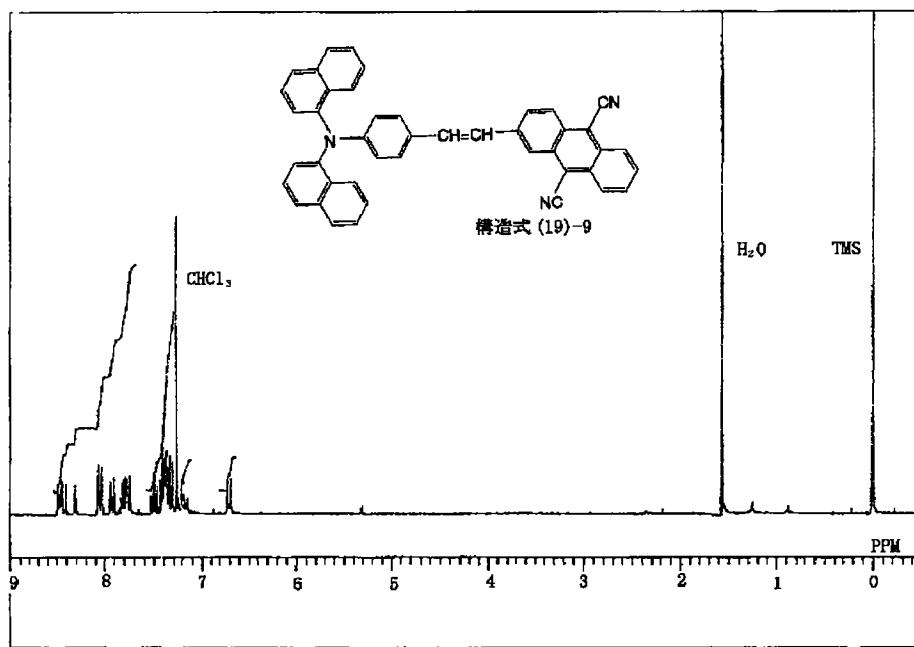
【図11】



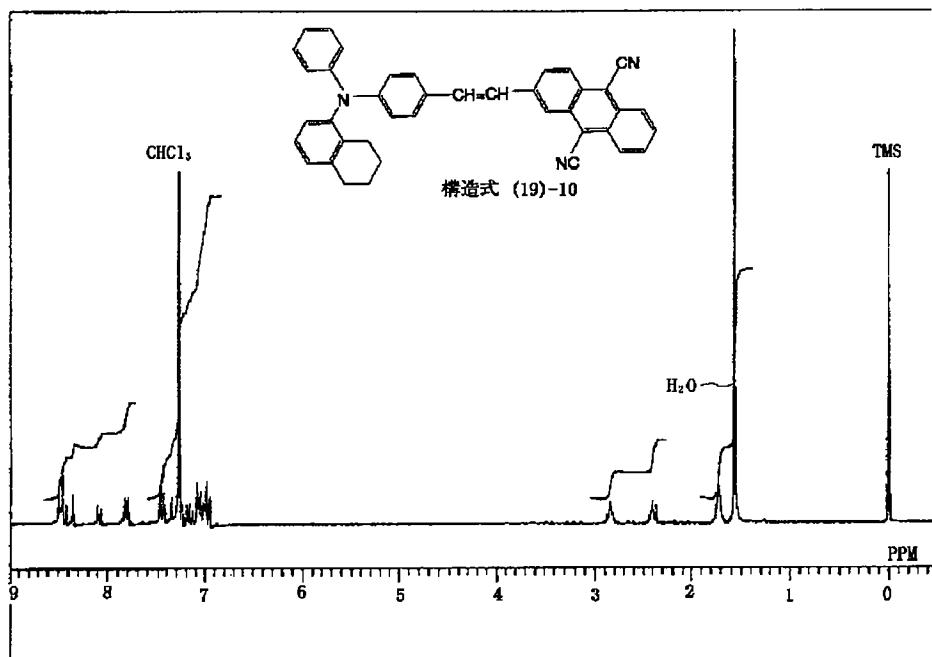
【图2】



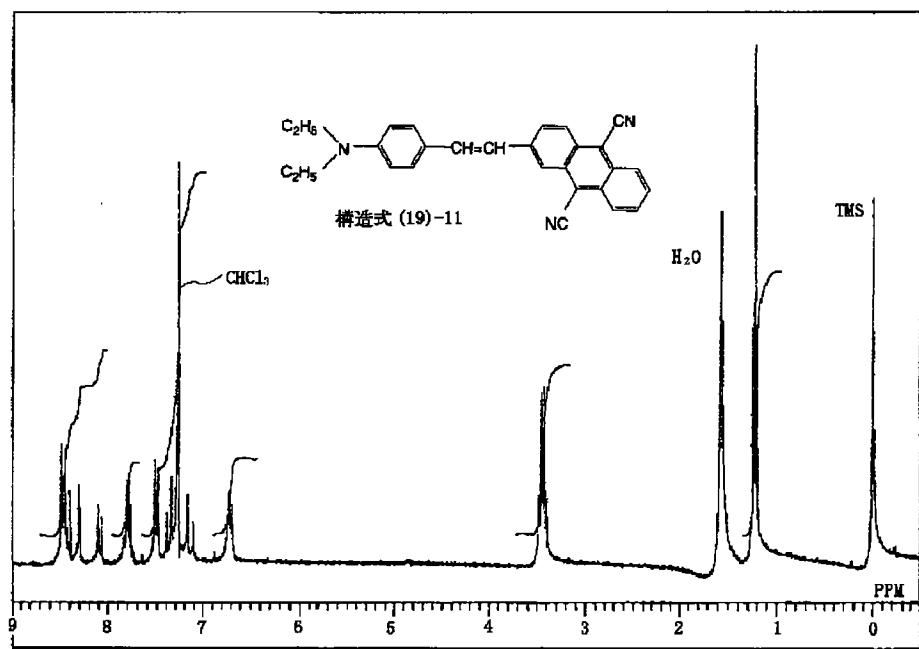
【図3】



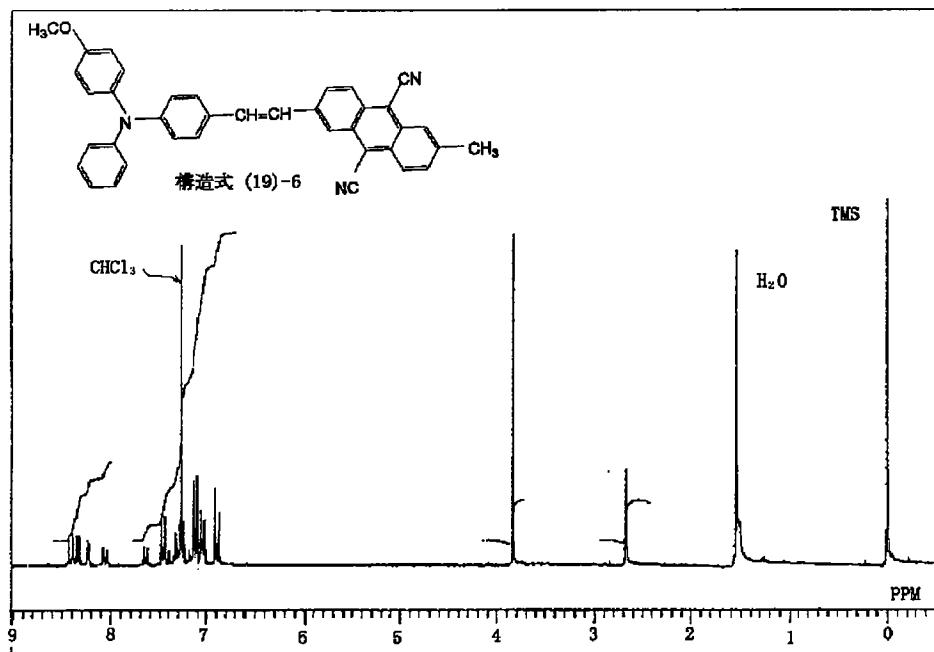
【図4】



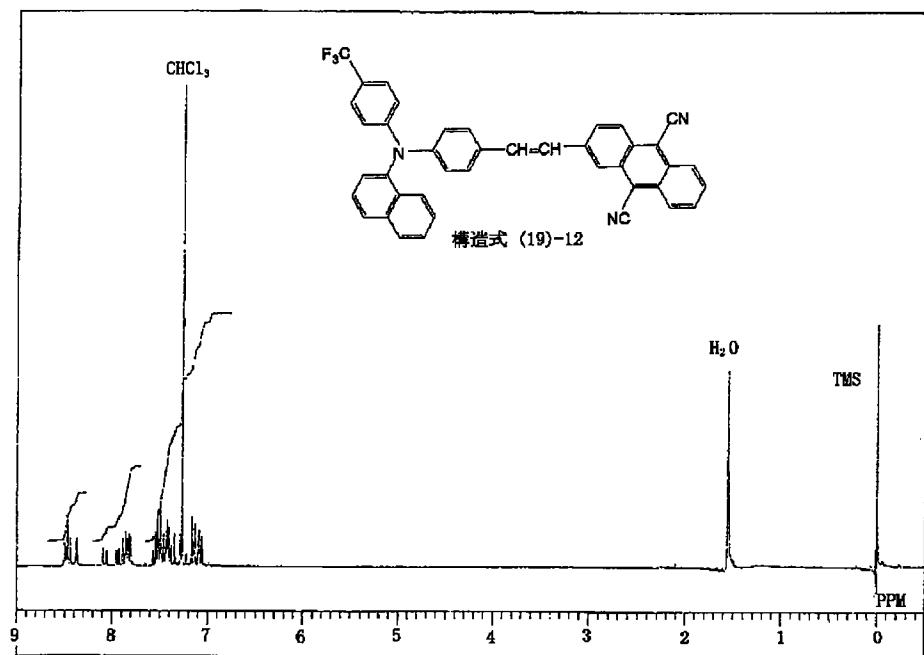
【図5】



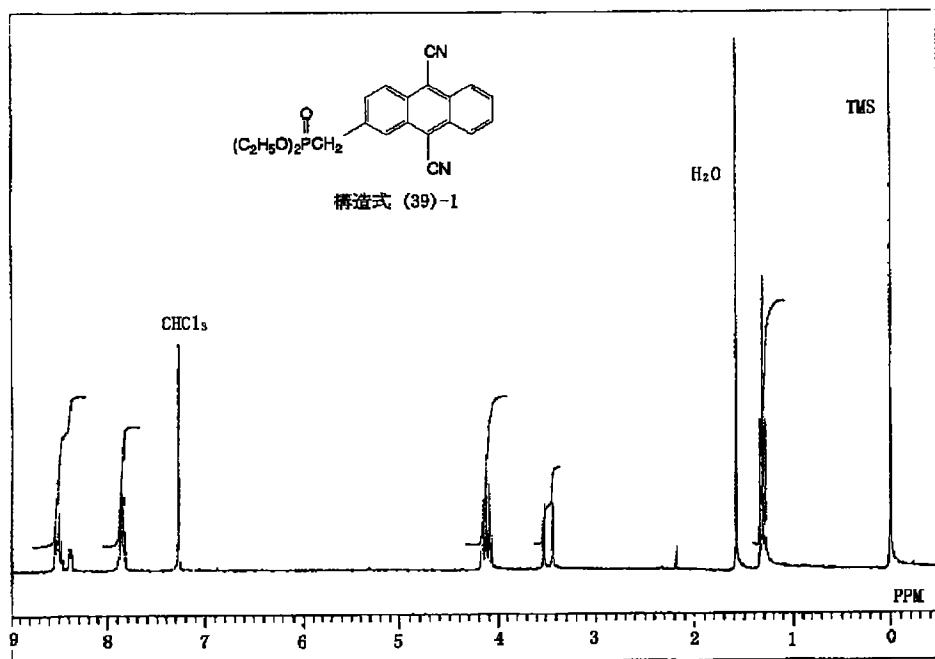
【図6】



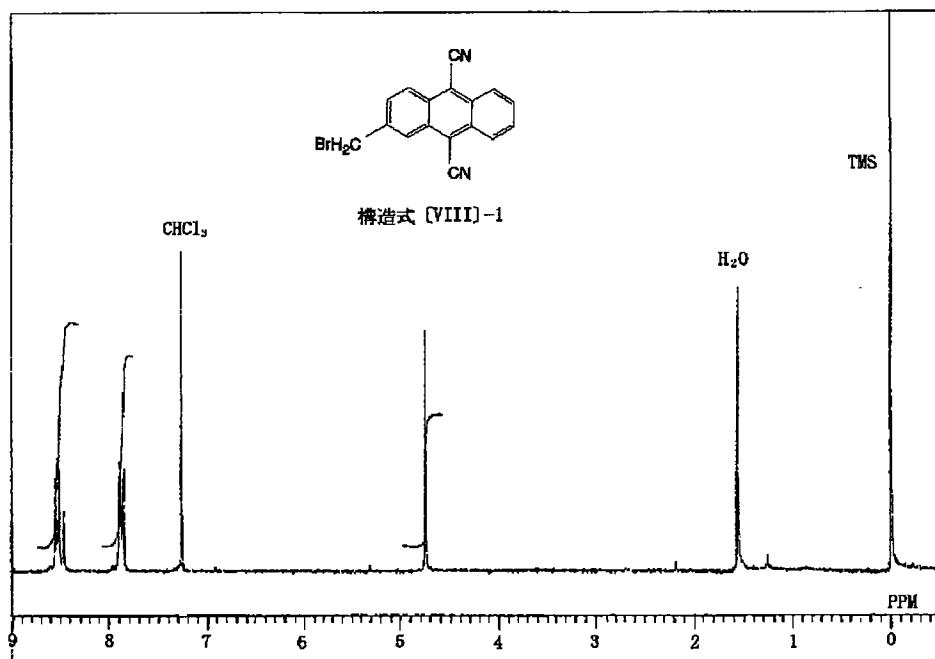
【図7】



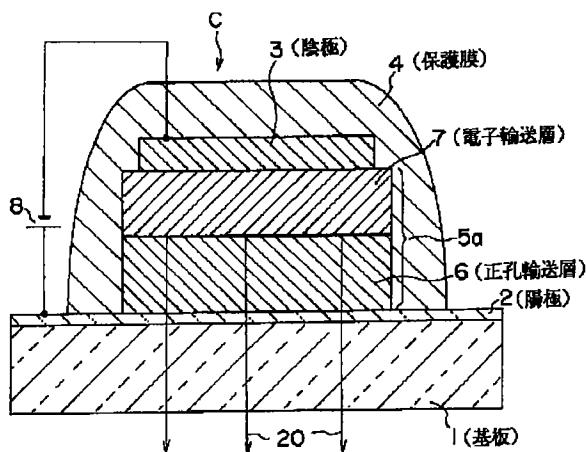
【図8】



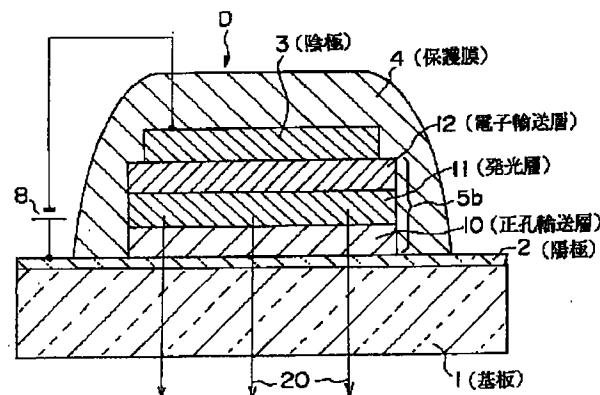
【図9】



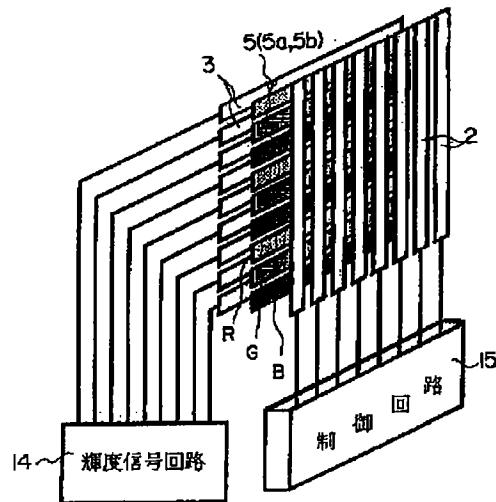
【図12】



【図13】



【図14】



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 H 0 5 B 33/14

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 一株式会社内

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WA26
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DB10 DB12 FA05

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C09K 11/06

(21)Application number : 2000-104582 (71)Applicant : SONY CORP

(22)Date of filing : 06.04.2000 (72)Inventor : ICHIMURA MARI

ISHIBASHI TADASHI

TAMURA SHINICHIRO

(54) AMINOSTYRYLANTHACENE COMPOUND AND INTERMEDIATE FOR
SYNTHEZIZING THE SAME, AND METHOD FOR PRODUCING THESE
COMPOUNDS

(57)Abstract:

PROBLEM TO BE SOLVED: To obtain an organic luminescent material giving
stable yellow to red luminescence with high luminance, and to provide a method

for producing the above material.

SOLUTION: This organic luminescent material is e.g. an aminostyrylanthracene compound of general formula I [R₂ is a nonsubstituted aryl group; R₁ is a (substituted) aryl group; and R₃ to R₅ are each H, cyano, a hydrocarbon group or the like] which is obtained by condensation reaction between the corresponding aminobenzaldehyde and a phosphonic ester or phosphonium salt.

[Date of request for examination]

[Date of sending the examiner's decision of rejection]

[Kind of final disposal of application other than the examiner's decision of rejection or application converted registration]

[Date of final disposal for application]

[Patent number]

[Date of registration]

[Number of appeal against examiner's decision of rejection]

[Date of requesting appeal against examiner's decision of rejection]

[Date of extinction of right]

Drawings are not displayable due to the volume of the data (more than 200 drawings).

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1. This document has been translated by computer. So the translation may not reflect the original precisely.
 2. **** shows the word which can not be translated.
 3. In the drawings, any words are not translated.
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CLAIMS

[Claim(s)]

[Claim 1] The amino styryl anthracene compound shown by the following general formula [I], [II], [III], or [IV].

[Formula 1]

In [however, said general formula [I], it is the aryl group as which R2 is a non-permuted aryl group, and R1 is expressed in the following general formula

(1), and is [Formula 2].

(However, in said general formula (1), R6, R7, R8, R9, and R10 are radicals which are identitas mutually or are different.) it is the aryl group which may have the hydrocarbon oxy-radical of with a hydrogen atom and a carbon numbers of one or more saturation or partial saturation, a hydrocarbon group, the hydrocarbon amino group, a fluoro alkyl group, or a substituent. R3 and R4 are radicals which are identitas mutually or are different. Those at least one A hydrogen atom, it is a cyano group, a fluoro alkyl group, a nitro group, or a halogen atom, and R5 is the aryl group which may have the hydrocarbon group of with a hydrogen atom and a carbon numbers of one or more saturation or partial saturation, or a substituent.]

[Formula 3]

It is a radical which R11 and R12 are identitases mutually in [however, said general formula [II], or is different, is the aryl group expressed with the following general formula (2), and is [Formula 4].

(However, in said general formula (2), R16, R17, R18, R19, and R20 are radicals which are identitas mutually or are different.) it is the aryl group which may have the hydrocarbon oxy-radical of with a hydrogen atom and a carbon numbers of one or more saturation or partial saturation, a hydrocarbon group, the hydrocarbon amino group, a fluoro alkyl group, or a substituent. R13 and R14

are radicals which are identitas mutually or are different. Those at least one A hydrogen atom, it is a cyano group, a fluoro alkyl group, a nitro group, or a halogen atom, and R15 is the aryl group which may have the hydrocarbon group of with a hydrogen atom and a carbon numbers of one or more saturation or partial saturation, or a substituent.]

[Formula 5]

It is the aryl group as which R21 is expressed in the following general formula (3) in [however, said general formula [III], and is [Formula 6].

In (said general formula (3 [however,]), R26, R27, R28, R29, and R30 are identitas or a different radical mutually, and are the hydrocarbon oxy-radical of with a hydrogen atom and a carbon numbers of one or more saturation or partial saturation, a hydrocarbon group, a hydrocarbon amino group, or a fluoro alkyl group.) and R22 are aryl groups expressed with the following general formula (4), and are [Formula 7].

(However, in said general formula (4), R31, R32, R33, R34, R35, R36, and R37 are radicals which are identitas mutually or are different.) it is the aryl group which may have the hydrocarbon oxy-radical of with a hydrogen atom and a carbon numbers of one or more saturation or partial saturation, a hydrocarbon group, the hydrocarbon amino group, a fluoro alkyl group, or a substituent. R23 and R24 are radicals which are identitas mutually or are different. Those at least

one A hydrogen atom, it is a cyano group, a fluoro alkyl group, a nitro group, or a halogen atom, and R25 is the aryl group which may have the hydrocarbon group of with a hydrogen atom and a carbon numbers of one or more saturation or partial saturation, or a substituent.]

[Formula 8]

(However, in said general formula [IV], R38 and R39 are radicals which are identitas mutually or are different.) it is the hydrocarbon group of with a hydrogen atom and a carbon numbers of one or more saturation or partial saturation. R40 and R41 are radicals which are identitas mutually or are different. Those at least one A hydrogen atom, it is a cyano group, a fluoro alkyl group, a nitro group, or a halogen atom, and R42 is the aryl group which may have the hydrocarbon group of with a hydrogen atom and a carbon numbers of one or more saturation or partial saturation, or a substituent.]

[Claim 2] The amino styryl anthracene compound which is expressed with the following general formula (5) and which was indicated to claim 1.

[Formula 9]

[-- however, in said general formula (5), Ar1 and Ar2 may have a substituent, respectively -- mutual -- identitas -- or the radical which is a different aryl group and was chosen from the aryl group expressed with the following general formula (6), (7), (8), (9), (10), and (11) when it has a substituent -- it is --

[Formula 10]

[Formula 11]

(However, it sets to said general formula (6), (7), (8), (9), (10), and (11).) R44, R45, and R46 The hydrocarbon group of with a carbon numbers of one or more saturation or partial saturation, Or are a fluoro alkyl group, and R47, R48, R49, R50, R51, and R52 are identitases mutually, or differ. it is the hydrocarbon group of with a carbon numbers of one or more saturation or partial saturation, or a fluoro alkyl group, n is the integer of 0-5, m is the integer of 0-3, and l is the integer of 0-3. R43 is the aryl group which may have the hydrocarbon group of with a hydrogen atom and a carbon numbers of one or more saturation or partial saturation, or a substituent.]

[Claim 3] The amino styryl anthracene compound said whose carbon numbers of R44, R45, R46, R47, R48, R49, R50, R51, and R52 are 1-6 and which was indicated to claim 2.

[Claim 4] The amino styryl anthracene compound which is expressed with the following general formula (12), (13), (14), (15), (16), (17), or (18) and which was indicated to claim 2.

[Formula 12]

(However, in said general formula (12), R53 is the aryl group which may have the hydrocarbon group of the saturation of carbon numbers 1-6, or partial

saturation, or a substituent, and R54 is the aryl group which may have the hydrocarbon group of the saturation of a hydrogen atom and carbon numbers 1-6, or partial saturation, or a substituent.)

[Formula 13]

(However, in said general formula (13), R55 is the aryl group which may have the hydrocarbon group of the saturation of carbon numbers 1-6, or partial saturation, a trifluoromethyl radical, or a substituent, and R56 is the aryl group which may have the hydrocarbon group of the saturation of a hydrogen atom and carbon numbers 1-6, or partial saturation, or a substituent.)

[Formula 14]

(However, in said general formula (14), R57 and R58 are the aryl groups which may have the hydrocarbon group of the saturation of carbon numbers 1-6, or partial saturation, a trifluoromethyl radical, or a substituent, and R59 is the aryl group which may have the hydrocarbon group of the saturation of a hydrogen atom and carbon numbers 1-6, or partial saturation, or a substituent.)

[Formula 15]

(However, in said general formula (15), R60 is the aryl group which may have the hydrocarbon group of the saturation of carbon numbers 1-6, or partial saturation, or a substituent, and R61 is the aryl group which may have the hydrocarbon group of the saturation of a hydrogen atom and carbon numbers

1-6, or partial saturation, or a substituent.)

[Formula 16]

(However, in said general formula (16), R62 is the aryl group which may have the hydrocarbon group of the saturation of carbon numbers 1-6, or partial saturation, or a substituent, and R63 is the aryl group which may have the hydrocarbon group of the saturation of a hydrogen atom and carbon numbers 1-6, or partial saturation, or a substituent.)

[Formula 17]

(However, in said general formula (17), R64 is the aryl group which may have the hydrocarbon group of the saturation of carbon numbers 1-6, or partial saturation, or a substituent, and R65 is the aryl group which may have the hydrocarbon group of the saturation of a hydrogen atom and carbon numbers 1-6, or partial saturation, or a substituent.)

[Formula 18]

(However, in said general formula (18), R66 and R67 are the aryl groups which may have the hydrocarbon group of the saturation of carbon numbers 1-6, or partial saturation, or a substituent, and R68 is the aryl group which may have the hydrocarbon group of the saturation of a hydrogen atom and carbon numbers 1-6, or partial saturation, or a substituent.)

[Claim 5] The following structure expression (19) Amino styryl anthracene

compound which is expressed with -1, (19)-2, (19)-3, (19)-4, (19)-5, (19)-6, (19)-7, (19)-8, (19)-9, (19)-10, (19)-11, or (19)-12 and which was indicated to claim 2.

[Formula 19]

[Formula 20]

[Formula 21]

[Formula 22]

[Formula 23]

[Claim 6] The amino styryl anthracene compound which is expressed with the following general formula (20) and which was indicated to claim 1.

[Formula 24]

however, in said general formula (20), Ar1 and Ar2 may have a substituent, respectively -- mutual -- identitas -- or the radical which is a different aryl group and was chosen from the aryl group expressed with the following general formula (6), (7), (8), (9), (10), and (11) when it has a substituent -- it is --

[Formula 25]

[Formula 26]

(However, it sets to said general formula (6), (7), (8), (9), (10), and (11).) R44, R45, and R46 The hydrocarbon group of with a carbon numbers of one or more saturation or partial saturation, Or are a fluoro alkyl group, and R47, R48, R49,

R50, R51, and R52 are identitases mutually, or differ. it is the hydrocarbon group of with a carbon numbers of one or more saturation or partial saturation, or a fluoro alkyl group, n is the integer of 0-5, m is the integer of 0-3, and l is the integer of 0-3. R69 is the aryl group which may have the hydrocarbon group of with a hydrogen atom and a carbon numbers of one or more saturation or partial saturation, or a substituent.]

[Claim 7] The amino styryl anthracene compound said whose carbon numbers of R44, R45, R46, R47, R48, R49, R50, R51, and R52 are 1-6 and which was indicated to claim 6.

[Claim 8] The amino styryl anthracene compound which is expressed with the following general formula (21), (22), (23), (24), (25), (26), or (27) and which was indicated to claim 6.

[Formula 27]

(However, in said general formula (21), R70 is the aryl group which may have the hydrocarbon group of the saturation of carbon numbers 1-6, or partial saturation, or a substituent, and R71 is the aryl group which may have the hydrocarbon group of the saturation of a hydrogen atom and carbon numbers 1-6, or partial saturation, or a substituent.)

[Formula 28]

(However, in said general formula (22), R72 is the aryl group which may have

the hydrocarbon group of the saturation of carbon numbers 1-6, or partial saturation, a trifluoromethyl radical, or a substituent, and R73 is the aryl group which may have the hydrocarbon group of the saturation of a hydrogen atom and carbon numbers 1-6, or partial saturation, or a substituent.)

[Formula 29]

(However, in said general formula (23), R74 and R75 are the aryl groups which may have the hydrocarbon group of the saturation of carbon numbers 1-6, or partial saturation, a trifluoromethyl radical, or a substituent, and R76 is the aryl group which may have the hydrocarbon group of the saturation of a hydrogen atom and carbon numbers 1-6, or partial saturation, or a substituent.)

[Formula 30]

(However, in said general formula (24), R77 is the aryl group which may have the hydrocarbon group of the saturation of carbon numbers 1-6, or partial saturation, or a substituent, and R78 is the aryl group which may have the hydrocarbon group of the saturation of a hydrogen atom and carbon numbers 1-6, or partial saturation, or a substituent.)

[Formula 31]

(However, in said general formula (25), R79 is the aryl group which may have the hydrocarbon group of the saturation of carbon numbers 1-6, or partial saturation, or a substituent, and R80 is the aryl group which may have the

hydrocarbon group of the saturation of a hydrogen atom and carbon numbers 1-6, or partial saturation, or a substituent.)

[Formula 32]

(However, in said general formula (26), R81 is the aryl group which may have the hydrocarbon group of the saturation of carbon numbers 1-6, or partial saturation, or a substituent, and R82 is the aryl group which may have the hydrocarbon group of the saturation of a hydrogen atom and carbon numbers 1-6, or partial saturation, or a substituent.)

[Formula 33]

(However, in said general formula (27), R83 and R84 are the aryl groups which may have the hydrocarbon group of the saturation of carbon numbers 1-6, or partial saturation, or a substituent, and R85 is the aryl group which may have the hydrocarbon group of the saturation of a hydrogen atom and carbon numbers 1-6, or partial saturation, or a substituent.)

[Claim 9] The following structure expression (28) Amino styryl anthracene compound which is expressed with -1, (28)-2, (28)-3, (28)-4, (28)-5, (28)-6, (28)-7, (28)-8, (28)-9, (28)-10, (28)-11, or (28)-12 and which was indicated to claim 6.

[Formula 34]

[Formula 35]

[Formula 36]

[Formula 37]

[Formula 38]

[Claim 10] The amino styryl anthracene compound which is expressed with the following general formula (29) and which was indicated to claim 1.

[Formula 39]

however, in said general formula (29), Ar1 and Ar2 may have a substituent, respectively -- mutual -- identitas -- or the radical which is a different aryl group and was chosen from the aryl group expressed with the following general formula (6), (7), (8), (9), (10), and (11) when it has a substituent -- it is --

[Formula 40]

[Formula 41]

(However, it sets to said general formula (6), (7), (8), (9), (10), and (11).) R44, R45, and R46 The hydrocarbon group of with a carbon numbers of one or more saturation or partial saturation, Or are a fluoro alkyl group, and R47, R48, R49, R50, R51, and R52 are identitases mutually, or differ. it is the hydrocarbon group of with a carbon numbers of one or more saturation or partial saturation, or a fluoro alkyl group, n is the integer of 0-5, m is the integer of 0-3, and l is the integer of 0-3. R86 is the aryl group which may have the hydrocarbon group of with a hydrogen atom and a carbon numbers of one or more saturation or partial

saturation, or a substituent.]

[Claim 11] The amino styryl anthracene compound said whose carbon numbers of R44, R45, R46, R47, R48, R49, R50, R51, and R52 are 1-6 and which was indicated to claim 10.

[Claim 12] The amino styryl anthracene compound which is expressed with the following general formula (30), (31), (32), (33), (34), (35), or (36) and which was indicated to claim 10.

[Formula 42]

(However, in said general formula (30), R87 is the aryl group which may have the hydrocarbon group of the saturation of carbon numbers 1-6, or partial saturation, or a substituent, and R88 is the aryl group which may have the hydrocarbon group of the saturation of a hydrogen atom and carbon numbers 1-6, or partial saturation, or a substituent.)

[Formula 43]

(However, in said general formula (31), R89 is the aryl group which may have the hydrocarbon group of the saturation of carbon numbers 1-6, or partial saturation, a trifluoromethyl radical, or a substituent, and R90 is the aryl group which may have the hydrocarbon group of the saturation of a hydrogen atom and carbon numbers 1-6, or partial saturation, or a substituent.)

[Formula 44]

(However, in said general formula (32), R91 and R92 are the aryl groups which may have the hydrocarbon group of the saturation of carbon numbers 1-6, or partial saturation, a trifluoromethyl radical, or a substituent, and R93 is the aryl group which may have the hydrocarbon group of the saturation of a hydrogen atom and carbon numbers 1-6, or partial saturation, or a substituent.)

[Formula 45]

(However, in said general formula (33), R94 is the aryl group which may have the hydrocarbon group of the saturation of carbon numbers 1-6, or partial saturation, or a substituent, and R95 is the aryl group which may have the hydrocarbon group of the saturation of a hydrogen atom and carbon numbers 1-6, or partial saturation, or a substituent.)

[Formula 46]

(However, in said general formula (34), R96 is the aryl group which may have the hydrocarbon group of the saturation of carbon numbers 1-6, or partial saturation, or a substituent, and R97 is the aryl group which may have the hydrocarbon group of the saturation of a hydrogen atom and carbon numbers 1-6, or partial saturation, or a substituent.)

[Formula 47]

(However, in said general formula (35), R98 is the aryl group which may have the hydrocarbon group of the saturation of carbon numbers 1-6, or partial

saturation, or a substituent, and R99 is the aryl group which may have the hydrocarbon group of the saturation of a hydrogen atom and carbon numbers 1-6, or partial saturation, or a substituent.)

[Formula 48]

(However, in said general formula (36), R100 and R101 are the aryl groups which may have the hydrocarbon group of the saturation of carbon numbers 1-6, or partial saturation, or the substituent, and R102 is the aryl group which may have the hydrocarbon group of the saturation of a hydrogen atom and carbon numbers 1-6, or partial saturation, or a substituent.)

[Claim 13] The following structure expression (37) Amino styryl anthracene compound which is expressed with -1, (37)-2, (37)-3, (37)-4, (37)-5, (37)-6, (37)-7, (37)-8, (37)-9, (37)-10, (37)-11, or (37)-12 and which was indicated to claim 10.

[Formula 49]

[Formula 50]

[Formula 51]

[Formula 52]

[Formula 53]

[Claim 14] The manufacture approach of an amino styryl anthracene compound of obtaining the amino styryl anthracene compound expressed with the following

general formula [I], [II], [III], or [IV] by carrying out condensation of the phosphonium salt and; which are expressed with the phosphonate or the following general formula [VII] expressed with the amino benzaldehyde expressed with the following general formula [V], and the; following general formula [VI].

[Formula 54]

(However, in said general formula [V], R103 and R104 are the radicals equivalent to following R1, R2, R11, R12, R21, R22 and R38, or R39, respectively.)

[Formula 55]

(However, in said general formula [VI] and [VII], R105 is a hydrocarbon group, R106 and R107 are the radicals equivalent to following R3, R4, R13, R14, R23, R24 and R40, or R41, respectively, R108 is a radical equivalent to following R5, R16 and R25, or R42, and X is a halogen atom.)

[Formula 56]

In [however, said general formula [I], it is the aryl group as which R2 is a non-permuted aryl group, and R1 is expressed in the following general formula (1), and is [Formula 57].

(However, in said general formula (1), R6, R7, R8, R9, and R10 are radicals which are identitas mutually or are different.) it is the aryl group which may have

the hydrocarbon oxy-radical of with a hydrogen atom and a carbon numbers of one or more saturation or partial saturation, a hydrocarbon group, the hydrocarbon amino group, a fluoro alkyl group, or a substituent. R3 and R4 are radicals which are identitas mutually or are different. Those at least one A hydrogen atom, it is a cyano group, a fluoro alkyl group, a nitro group, or a halogen atom, and R5 is the aryl group which may have the hydrocarbon group of with a hydrogen atom and a carbon numbers of one or more saturation or partial saturation, or a substituent.]

[Formula 58]

It is a radical which R11 and R12 are identitases mutually in [however, said general formula [II], or is different, is the aryl group expressed with the following general formula (2), and is [Formula 59].

(However, in said general formula (2), R16, R17, R18, R19, and R20 are radicals which are identitas mutually or are different.) it is the aryl group which may have the hydrocarbon oxy-radical of with a hydrogen atom and a carbon numbers of one or more saturation or partial saturation, a hydrocarbon group, the hydrocarbon amino group, a fluoro alkyl group, or a substituent. R13 and R14 are radicals which are identitas mutually or are different. Those at least one A hydrogen atom, it is a cyano group, a fluoro alkyl group, a nitro group, or a halogen atom, and R15 is the aryl group which may have the hydrocarbon group

of with a hydrogen atom and a carbon numbers of one or more saturation or partial saturation, or a substituent.]

[Formula 60]

It is the aryl group as which R21 is expressed in the following general formula (3) in [however, said general formula [III], and is [Formula 61].

In (said general formula (3 [however,]), R26, R27, R28, R29, and R30 are identitas or a different radical mutually, and are the hydrocarbon oxy-radical of with a hydrogen atom and a carbon numbers of one or more saturation or partial saturation, a hydrocarbon group, a hydrocarbon amino group, or a fluoro alkyl group.) and R22 are aryl groups expressed with the following general formula (4), and are [Formula 62].

(However, in said general formula (4), R31, R32, R33, R34, R35, R36, and R37 are radicals which are identitas mutually or are different.) it is the aryl group which may have the hydrocarbon oxy-radical of with a hydrogen atom and a carbon numbers of one or more saturation or partial saturation, a hydrocarbon group, the hydrocarbon amino group, a fluoro alkyl group, or a substituent. R23 and R24 are radicals which are identitas mutually or are different. Those at least one A hydrogen atom, it is a cyano group, a fluoro alkyl group, a nitro group, or a halogen atom, and R25 is the aryl group which may have the hydrocarbon group of with a hydrogen atom and a carbon numbers of one or more saturation or

partial saturation, or a substituent.]

[Formula 63]

(However, in said general formula [IV], R38 and R39 are radicals which are identitas mutually or are different.) it is the hydrocarbon group of with a hydrogen atom and a carbon numbers of one or more saturation or partial saturation. R40 and R41 are radicals which are identitas mutually or are different. Those at least one A hydrogen atom, it is a cyano group, a fluoro alkyl group, a nitro group, or a halogen atom, and R42 is the aryl group which may have the hydrocarbon group of with a hydrogen atom and a carbon numbers of one or more saturation or partial saturation, or a substituent.]

[Claim 15] The manufacture approach of the amino styryl anthracene compound indicated to claim 14 to which the Wittig-Horner (Wittig-Horner) reaction or the Wittig (Wittig) reaction performs said condensation, a carbanion is made to generate by processing said phosphonate and/or said phosphonium salt by the base in a solvent, and condensation of this carbanion and said amino benzaldehyde is carried out.

[Claim 16] It faces obtaining the amino styryl anthracene compound expressed with the following general formula (5), and is [Formula 64].

[-- however, in said general formula (5), Ar1 and Ar2 may have a substituent, respectively -- mutual -- identitas -- or the radical which is a different aryl group

and was chosen from the aryl group expressed with the following general formula (6), (7), (8), (9), (10), and (11) when it has a substituent -- it is --

[Formula 65]

[Formula 66]

(However, it sets to said general formula (6), (7), (8), (9), (10), and (11).) R44,

R45, and R46 The hydrocarbon group of with a carbon numbers of one or more

saturation or partial saturation, Or are a fluoro alkyl group, and R47, R48, R49,

R50, R51, and R52 are identitases mutually, or differ. it is the hydrocarbon group

of with a carbon numbers of one or more saturation or partial saturation, or a

fluoro alkyl group, n is the integer of 0-5, m is the integer of 0-3, and l is the

integer of 0-3. R43 is the aryl group which may have the hydrocarbon group of

with a hydrogen atom and a carbon numbers of one or more saturation or partial

saturation, or a substituent.] The manufacture approach of the amino styryl

anthracene compound indicated to claim 14 of carrying out condensation of; to

the phosphonium salt expressed with the phosphonate or the following general

formula (40) expressed with 4-(N and N-diaryl amino) benzaldehyde expressed

with the following general formula (38), and the; following general formula (39).

[Formula 67]

(However, in said general formula (38), (39), and (40), Ar1, Ar2, R105, and X are

the same as the above mentioned thing.)

[Claim 17] The manufacture approach of an amino styryl anthracene compound which makes said R105 the saturated hydrocarbon radical of carbon numbers 1-4 and which was indicated to claim 14.

[Claim 18] The manufacture approach of an amino styryl anthracene compound which sets said carbon number of R44, R45, R46, R47, R48, R49, R50, R51, and R52 to 1-6 and which was indicated to claim 16.

[Claim 19] The manufacture approach of the amino styryl anthracene compound indicated to claim 16 of obtaining the amino styryl anthracene compound expressed with the following general formula (12), (13), (14), (15), (16), (17), or (18).

[Formula 68]

(However, in said general formula (12), R53 is the aryl group which may have the hydrocarbon group of the saturation of carbon numbers 1-6, or partial saturation, or a substituent, and R54 is the aryl group which may have the hydrocarbon group of the saturation of a hydrogen atom and carbon numbers 1-6, or partial saturation, or a substituent.)

[Formula 69]

(However, in said general formula (13), R55 is the aryl group which may have the hydrocarbon group of the saturation of carbon numbers 1-6, or partial saturation, a trifluoromethyl radical, or a substituent, and R56 is the aryl group

which may have the hydrocarbon group of the saturation of a hydrogen atom and carbon numbers 1-6, or partial saturation, or a substituent.)

[Formula 70]

(However, in said general formula (14), R57 and R58 are the aryl groups which may have the hydrocarbon group of the saturation of carbon numbers 1-6, or partial saturation, a trifluoromethyl radical, or a substituent, and R59 is the aryl group which may have the hydrocarbon group of the saturation of a hydrogen atom and carbon numbers 1-6, or partial saturation, or a substituent.)

[Formula 71]

(However, in said general formula (15), R60 is the aryl group which may have the hydrocarbon group of the saturation of carbon numbers 1-6, or partial saturation, or a substituent, and R61 is the aryl group which may have the hydrocarbon group of the saturation of a hydrogen atom and carbon numbers 1-6, or partial saturation, or a substituent.)

[Formula 72]

(However, in said general formula (16), R62 is the aryl group which may have the hydrocarbon group of the saturation of carbon numbers 1-6, or partial saturation, or a substituent, and R63 is the aryl group which may have the hydrocarbon group of the saturation of a hydrogen atom and carbon numbers 1-6, or partial saturation, or a substituent.)

[Formula 73]

(However, in said general formula (17), R64 is the aryl group which may have the hydrocarbon group of the saturation of carbon numbers 1-6, or partial saturation, or a substituent, and R65 is the aryl group which may have the hydrocarbon group of the saturation of a hydrogen atom and carbon numbers 1-6, or partial saturation, or a substituent.)

[Formula 74]

(However, in said general formula (18), R66 and R67 are the aryl groups which may have the hydrocarbon group of the saturation of carbon numbers 1-6, or partial saturation, or a substituent, and R68 is the aryl group which may have the hydrocarbon group of the saturation of a hydrogen atom and carbon numbers 1-6, or partial saturation, or a substituent.)

[Claim 20] the following structure expression (19) -1, (19)-2, (19)-3, and (19) -4, (19)-5, (19)-6, and (19) -7, (19)-8, (19)-9, and (19) -- the manufacture approach of the amino styryl anthracene compound indicated to claim 16 of obtaining the amino styryl anthracene compound expressed with -10, (19)-11, or (19)-12

[Formula 75]

[Formula 76]

[Formula 77]

[Formula 78]

[Formula 79]

[Claim 21] It faces obtaining the amino styryl anthracene compound expressed with the following general formula (20), and is [Formula 80].

however, in said general formula (20), Ar1 and Ar2 may have a substituent, respectively -- mutual -- identitas -- or the radical which is a different aryl group and was chosen from the aryl group expressed with the following general formula (6), (7), (8), (9), (10), and (11) when it has a substituent -- it is --

[Formula 81]

[Formula 82]

(However, it sets to said general formula (6), (7), (8), (9), (10), and (11).) R44, R45, and R46 The hydrocarbon group of with a carbon numbers of one or more saturation or partial saturation, Or are a fluoro alkyl group, and R47, R48, R49, R50, R51, and R52 are identitases mutually, or differ. it is the hydrocarbon group of with a carbon numbers of one or more saturation or partial saturation, or a fluoro alkyl group, n is the integer of 0-5, m is the integer of 0-3, and l is the integer of 0-3. R69 is the aryl group which may have the hydrocarbon group of with a hydrogen atom and a carbon numbers of one or more saturation or partial saturation, or a substituent.] The manufacture approach of the amino styryl

anthracene compound indicated to claim 14 of carrying out condensation of; to the phosphonium salt expressed with the phosphonate or the following general

formula (42) expressed with 4-(N and N-diaryl amino) benzaldehyde expressed with the following general formula (38), and the; following general formula (41).

[Formula 83]

(However, in said general formula (38), (41), and (42), Ar1, Ar2, R105, and X are the same as the above mentioned thing.)

[Claim 22] The manufacture approach of an amino styryl anthracene compound which sets said carbon number of R44, R45, R46, R47, R48, R49, R50, R51, and R52 to 1-6 and which was indicated to claim 21.

[Claim 23] The manufacture approach of the amino styryl anthracene compound indicated to claim 21 of obtaining the amino styryl anthracene compound expressed with the following general formula (21), (22), (23), (24), (25), (26), or (27).

[Formula 84]

(However, in said general formula (21), R70 is the aryl group which may have the hydrocarbon group of the saturation of carbon numbers 1-6, or partial saturation, or a substituent, and R71 is the aryl group which may have the hydrocarbon group of the saturation of a hydrogen atom and carbon numbers 1-6, or partial saturation, or a substituent.)

[Formula 85]

(However, in said general formula (22), R72 is the aryl group which may have

the hydrocarbon group of the saturation of carbon numbers 1-6, or partial saturation, a trifluoromethyl radical, or a substituent, and R73 is the aryl group which may have the hydrocarbon group of the saturation of a hydrogen atom and carbon numbers 1-6, or partial saturation, or a substituent.)

[Formula 86]

(However, in said general formula (23), R74 and R75 are the aryl groups which may have the hydrocarbon group of the saturation of carbon numbers 1-6, or partial saturation, a trifluoromethyl radical, or a substituent, and R76 is the aryl group which may have the hydrocarbon group of the saturation of a hydrogen atom and carbon numbers 1-6, or partial saturation, or a substituent.)

[Formula 87]

(However, in said general formula (24), R77 is the aryl group which may have the hydrocarbon group of the saturation of carbon numbers 1-6, or partial saturation, or a substituent, and R78 is the aryl group which may have the hydrocarbon group of the saturation of a hydrogen atom and carbon numbers 1-6, or partial saturation, or a substituent.)

[Formula 88]

(However, in said general formula (25), R79 is the aryl group which may have the hydrocarbon group of the saturation of carbon numbers 1-6, or partial saturation, or a substituent, and R80 is the aryl group which may have the

hydrocarbon group of the saturation of a hydrogen atom and carbon numbers 1-6, or partial saturation, or a substituent.)

[Formula 89]

(However, in said general formula (26), R81 is the aryl group which may have the hydrocarbon group of the saturation of carbon numbers 1-6, or partial saturation, or a substituent, and R82 is the aryl group which may have the hydrocarbon group of the saturation of a hydrogen atom and carbon numbers 1-6, or partial saturation, or a substituent.)

[Formula 90]

(However, in said general formula (27), R83 and R84 are the aryl groups which may have the hydrocarbon group of the saturation of carbon numbers 1-6, or partial saturation, or a substituent, and R85 is the aryl group which may have the hydrocarbon group of the saturation of a hydrogen atom and carbon numbers 1-6, or partial saturation, or a substituent.)

[Claim 24] the following structure expression (28) -1, (28)-2, (28)-3, and (28) -4, (28)-5, (28)-6, and (28) -7, (28)-8, (28)-9, and (28) -- the manufacture approach of the amino styryl anthracene compound indicated to claim 21 of obtaining the amino styryl anthracene compound expressed with -10, (28)-11, or (28)-12

[Formula 91]

[Formula 92]

[Formula 93]

[Formula 94]

[Formula 95]

[Claim 25] It faces obtaining the amino styryl anthracene compound expressed

with the following general formula (29), and is [Formula 96].

however, in said general formula (29), Ar1 and Ar2 may have a substituent, respectively -- mutual -- identitas -- or the radical which is a different aryl group and was chosen from the aryl group expressed with the following general formula (6), (7), (8), (9), (10), and (11) when it has a substituent -- it is --

[Formula 97]

[Formula 98]

(However, it sets to said general formula (6), (7), (8), (9), (10), and (11).) R44,

R45, and R46 The hydrocarbon group of with a carbon numbers of one or more

saturation or partial saturation, Or are a fluoro alkyl group, and R47, R48, R49,

R50, R51, and R52 are identitases mutually, or differ. it is the hydrocarbon group

of with a carbon numbers of one or more saturation or partial saturation, or a

fluoro alkyl group, n is the integer of 0-5, m is the integer of 0-3, and l is the

integer of 0-3. R86 is the aryl group which may have the hydrocarbon group of

with a hydrogen atom and a carbon numbers of one or more saturation or partial

saturation, or a substituent.] The manufacture approach of the amino styryl

anthracene compound indicated to claim 14 of carrying out condensation of; to the phosphonium salt expressed with the phosphonate or the following general formula (44) expressed with 4-(N and N-diaryl amino) benzaldehyde expressed with the following general formula (38), and the; following general formula (43).

[Formula 99]

(However, in said general formula (38), (43), and (44), Ar1, Ar2, R105, and X are the same as the above mentioned thing.)

[Claim 26] The manufacture approach of an amino styryl anthracene compound which sets said carbon number of R44, R45, R46, R47, R48, R49, R50, R51, and R52 to 1-6 and which was indicated to claim 25.

[Claim 27] The manufacture approach of the amino styryl anthracene compound indicated to claim 25 of obtaining the amino styryl anthracene compound expressed with the following general formula (30), (31), (32), (33), (34), (35), or (36).

[Formula 100]

(However, in said general formula (30), R87 is the aryl group which may have the hydrocarbon group of the saturation of carbon numbers 1-6, or partial saturation, or a substituent, and R88 is the aryl group which may have the hydrocarbon group of the saturation of a hydrogen atom and carbon numbers 1-6, or partial saturation, or a substituent.)

[Formula 101]

(However, in said general formula (31), R89 is the aryl group which may have the hydrocarbon group of the saturation of carbon numbers 1-6, or partial saturation, a trifluoromethyl radical, or a substituent, and R90 is the aryl group which may have the hydrocarbon group of the saturation of a hydrogen atom and carbon numbers 1-6, or partial saturation, or a substituent.)

[Formula 102]

(However, in said general formula (32), R91 and R92 are the aryl groups which may have the hydrocarbon group of the saturation of carbon numbers 1-6, or partial saturation, a trifluoromethyl radical, or a substituent, and R93 is the aryl group which may have the hydrocarbon group of the saturation of a hydrogen atom and carbon numbers 1-6, or partial saturation, or a substituent.)

[Formula 103]

(However, in said general formula (33), R94 is the aryl group which may have the hydrocarbon group of the saturation of carbon numbers 1-6, or partial saturation, or a substituent, and R95 is the aryl group which may have the hydrocarbon group of the saturation of a hydrogen atom and carbon numbers 1-6, or partial saturation, or a substituent.)

[Formula 104]

(However, in said general formula (34), R96 is the aryl group which may have

the hydrocarbon group of the saturation of carbon numbers 1-6, or partial saturation, or a substituent, and R97 is the aryl group which may have the hydrocarbon group of the saturation of a hydrogen atom and carbon numbers 1-6, or partial saturation, or a substituent.)

[Formula 105]

(However, in said general formula (35), R98 is the aryl group which may have the hydrocarbon group of the saturation of carbon numbers 1-6, or partial saturation, or a substituent, and R99 is the aryl group which may have the hydrocarbon group of the saturation of a hydrogen atom or carbon numbers 1-6, or partial saturation, or a substituent.)

[Formula 106]

(However, in said general formula (36), R100 and R101 are the aryl groups which may have the hydrocarbon group of the saturation of carbon numbers 1-6, or partial saturation, or the substituent, and R102 is the aryl group which may have the hydrocarbon group of the saturation of a hydrogen atom and carbon numbers 1-6, or partial saturation, or a substituent.)

[Claim 28] the following structure expression (37) -1, (37)-2, (37)-3, and (37) -4, (37)-5, (37)-6, and (37) -7, (37)-8, (37)-9, and (37) -- the manufacture approach of the amino styryl anthracene compound indicated to claim 25 of obtaining the amino styryl anthracene compound expressed with -10, (37)-11, or (37)-12

[Formula 107]

[Formula 108]

[Formula 109]

[Formula 110]

[Formula 111]

[Claim 29] Phosphonate or phosphonium salt expressed with the following general formula [VI] or [VII].

[Formula 112]

(However, in said general formula [VI] and [VII], R105 is a hydrocarbon group, R106 and R107 are radicals which are identitas mutually or are different, those at least one is a hydrogen atom, a cyano group, a fluoro alkyl group, a nitro group, or a halogen atom, R108 is the aryl group which may have the hydrocarbon group of with a hydrogen atom and a carbon numbers of one or more saturation or partial saturation, or a substituent, and X is a halogen atom.)

[Claim 30] Phosphonate or phosphonium salt said R105 [whose] is the saturated hydrocarbon radical of carbon numbers 1-4 and which was indicated to claim 29.

[Claim 31] Phosphonate or phosphonium salt which is expressed with the following general formula (39) or (40) and which was indicated to claim 29.

[Formula 113]

[Claim 32] Phosphonate or phosphonium salt which is expressed with the following general formula (41) or (42) and which was indicated to claim 29.

[Formula 114]

[Claim 33] Phosphonate or phosphonium salt which is expressed with the following general formula (43) or (44) and which was indicated to claim 29.

[Formula 115]

[Claim 34] The manufacture approach of of the phosphonate or phosphonium salt which obtains the phosphonate or phosphonium salt expressed with the following general formula [VI] or [VII] by making the aryl halide compound expressed with the following general formula [VIII], and the phosphorous acid trialkyl or triphenyl phosphine (PPh_3) expressed with the following general formula [IX] react.

[Formula 116]

(However, in said general formula [VIII], R106 and R107 are radicals which are identitas mutually or are different, those at least one is a hydrogen atom, a cyano group, a fluoro alkyl group, a nitro group, or a halogen atom, R108 is the aryl group which may have the hydrocarbon group of with a hydrogen atom and a carbon numbers of one or more saturation or partial saturation, or a substituent, and X is a halogen atom.)

General formula [IX] : $\text{P}(\text{OR105})_3$ (however, in said general formula [IX], R105

is a hydrocarbon group.)

[Formula 117]

(However, in said general formula [VI] and [VII], R105, R106, R107, R108, and X

are the same as the above mentioned thing.)

[Claim 35] The manufacture approach of of the phosphonate or phosphonium salt which makes said R105 the saturated hydrocarbon radical of carbon numbers 1-4 and which was indicated to claim 34.

[Claim 36] The manufacture approach of of the phosphonate or phosphonium salt which obtains the phosphonate or phosphonium salt expressed with the following general formula (39) or (40) and which was indicated to claim 34.

[Formula 118]

[Claim 37] The manufacture approach of of the phosphonate or phosphonium salt which obtains the phosphonate or phosphonium salt expressed with the following general formula (41) or (42) and which was indicated to claim 34.

[Formula 119]

[Claim 38] The manufacture approach of of the phosphonate or phosphonium salt which obtains the phosphonate or phosphonium salt expressed with the following general formula (43) or (44) and which was indicated to claim 34.

[Formula 120]

[Claim 39] The aryl halide compound expressed with the following general

formula [VIII].

[Formula 121]

(However, in said general formula [VIII], R106 and R107 are radicals which are identitas mutually or are different, those at least one is a hydrogen atom, a cyano group, a fluoro alkyl group, a nitro group, or a halogen atom, R108 is the aryl group which may have the hydrocarbon group of with a hydrogen atom and a carbon numbers of one or more saturation or partial saturation, or a substituent, and X is a halogen atom.)

[Claim 40] The manufacture approach of an aryl halide compound of obtaining the aryl halide compound expressed with the following general formula [VIII] by making the anthracene compound expressed with the following general formula [X], and N-halogenation succinimide expressed with the following general formula [XI] reacting.

[Formula 122]

(However, in said general formula [X], R106 and R107 are radicals which are identitas mutually or are different, those at least one is a hydrogen atom, a cyano group, a fluoro alkyl group, a nitro group, or a halogen atom, and R108 is the aryl group which may have the hydrocarbon group of with a hydrogen atom and a carbon numbers of one or more saturation or partial saturation, or a substituent.)

[Formula 123]

(However, in said general formula [XI], X is a halogen atom.)

[Formula 124]

(However, in said general formula [VIII], R106, R107, R108, and X are the same as the above mentioned thing.)

DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to these manufacture approaches at an amino styryl anthracene compound suitable as an organic luminescent material which presents the desired luminescent color and its synthetic intermediate field, and a list.

[0002]

[Description of the Prior Art] It is spontaneous light, and a speed of response is high-speed, as one candidate of a flat-panel display without an angle-of-visibility dependency, organic electroluminescence devices (EL element) etc. attract attention recently, and the interest about an organic luminescent material as the component is increasing. Implementation of the full color organic light emitting

device which is in the place which can control the optical property of an ingredient to some extent by the molecular design, and created all of red, blue, and green three-primary-colors luminescence by each luminescent material by this is possible for the first advantage of an organic luminescent material.

[0003] Since the styryl compound shown by the following general formula [A] presents strong luminescence of blue - red to a visible-region field depending on the substituent introduced, it is available not only for an organic electroluminescence-devices ingredient but various applications. Furthermore, these ingredients are sublimability and have the advantage which can form the uniform amorphous film according to the process of vacuum deposition. Although the optical property of an ingredient can expect until to some extent by molecular orbital count etc. by the end of today, it cannot be overemphasized that the technique of manufacturing the ingredient demanded efficient in fact is the most important on industry.

[0004]

[Formula 125]

(However, in said general formula [A], Ar is the aryl group which may have a substituent, and Ra and Rb show the aryl group which may have the hydrocarbon group of a hydrogen atom, saturation, or partial saturation, and a substituent, a cyano group, a halogen atom, a nitro group, a hydrocarbon

oxy-radical, or the hydrocarbon amino group, respectively, and these may be the same or may differ.)

[0005]

[Problem(s) to be Solved by the Invention] Although many compounds which belong to said general formula [A] as an organic luminescent material have so far been manufactured What luminescence of these ingredients is blue - green, and many present luminescence of yellow - red is [only being reported slightly and]. [Institute of Electronics, Information and Communication Engineers,], such as a technical research report, organic electronics, 17 and 7 (1992), Inorganic and Organic Electroluminescence 96 Berlin, and 101 (1996), and the efficient manufacturing method of those were not established, either.

[0006] The purpose of this invention is especially in view of the above present condition to offer [the compound suitable as an organic luminescent material of yellow - red which presents strong luminescence and its synthetic intermediate field, and] the approach of manufacturing these efficient.

[0007]

[Means for Solving the Problem] In order that this invention may solve the above-mentioned technical problem, as a result of inquiring wholeheartedly, the amino styryl anthracene compound expressed with a general formula [I], [II], [III], or [IV] presents strong luminescence, a header and its general and efficient

manufacture approach are established, and this invention is reached [that it can become the luminescent material of yellow - red, and].

[0008] That is, this invention relates to the amino styryl anthracene compound (the compound of this invention is called hereafter.) expressed with the following general formula [I], [II], [III], or [IV] first.

[Formula 126]

In [however, said general formula [I], it is the aryl group as which R2 is a non-permuted aryl group, and R1 is expressed in the following general formula (1), and is [Formula 127].

(However, in said general formula (1), R6, R7, R8, R9, and R10 are radicals which are identitas mutually or are different.) it is the aryl group which may have the hydrocarbon oxy-radical of with a hydrogen atom and a carbon numbers of one or more saturation or partial saturation, a hydrocarbon group, the hydrocarbon amino group, a fluoro alkyl group, or a substituent. R3 and R4 are radicals which are identitas mutually or are different. Those at least one A hydrogen atom, it is a cyano group, a fluoro alkyl group, a nitro group, or a halogen atom, and R5 is the aryl group which may have the hydrocarbon group of with a hydrogen atom and a carbon numbers of one or more saturation or partial saturation, or a substituent.]

[Formula 128]

It is a radical which R11 and R12 are identitases mutually in [however, said general formula [II], or is different, is the aryl group expressed with the following general formula (2), and is [Formula 129].

(However, in said general formula (2), R16, R17, R18, R19, and R20 are radicals which are identitas mutually or are different.) it is the aryl group which may have the hydrocarbon oxy-radical of with a hydrogen atom and a carbon numbers of one or more saturation or partial saturation, a hydrocarbon group, the hydrocarbon amino group, a fluoro alkyl group, or a substituent. R13 and R14 are radicals which are identitas mutually or are different. Those at least one A hydrogen atom, it is a cyano group, a fluoro alkyl group, a nitro group, or a halogen atom, and R15 is the aryl group which may have the hydrocarbon group of with a hydrogen atom and a carbon numbers of one or more saturation or partial saturation, or a substituent.]

[Formula 130]

It is the aryl group as which R21 is expressed in the following general formula (3) in [however, said general formula [III], and is [Formula 131].

In (said general formula (3 [however,]), R26, R27, R28, R29, and R30 are identitas or a different radical mutually, and are the hydrocarbon oxy-radical of with a hydrogen atom and a carbon numbers of one or more saturation or partial saturation, a hydrocarbon group, a hydrocarbon amino group, or a fluoro alkyl

group.) and R22 are aryl groups expressed with the following general formula (4), and are [Formula 132].

(However, in said general formula (4), R31, R32, R33, R34, R35, R36, and R37 are radicals which are identitas mutually or are different.) it is the aryl group which may have the hydrocarbon oxy-radical of with a hydrogen atom and a carbon numbers of one or more saturation or partial saturation, a hydrocarbon group, the hydrocarbon amino group, a fluoro alkyl group, or a substituent. R23 and R24 are radicals which are identitas mutually or are different. Those at least one A hydrogen atom, it is a cyano group, a fluoro alkyl group, a nitro group, or a halogen atom, and R25 is the aryl group which may have the hydrocarbon group of with a hydrogen atom and a carbon numbers of one or more saturation or partial saturation, or a substituent.]

[Formula 133]

(However, in said general formula [IV], R38 and R39 are radicals which are identitas mutually or are different.) it is the hydrocarbon group of with a hydrogen atom and a carbon numbers of one or more saturation or partial saturation. R40 and R41 are radicals which are identitas mutually or are different. Those at least one A hydrogen atom, it is a cyano group, a fluoro alkyl group, a nitro group, or a halogen atom, and R42 is the aryl group which may have the hydrocarbon group of with a hydrogen atom and a carbon numbers of one or more saturation or

partial saturation, or a substituent.]

[0009] It is the compound which can use the compound of this invention effectively as an organic luminescent material which shows the luminescent color of yellow - red, and has a high glass transition point and the high melting point, and when excelled in electric, thermal, or chemical stability, it is amorphous, and since a vitreous state can be formed easily, vacuum evaporationo etc. can be performed.

[0010] As for the compound of this invention, what is expressed with the following general formula is desirable.

[Formula 134]

[-- however, in said general formula (5), Ar1 and Ar2 may have a substituent, respectively -- mutual -- identitas -- or the radical which is a different aryl group and was chosen from the aryl group expressed with the following general formula (6), (7), (8), (9), (10), and (11) when it has a substituent -- it is --

[Formula 135]

[Formula 136]

(However, it sets to said general formula (6), (7), (8), (9), (10), and (11).) R44, R45, and R46 The hydrocarbon group of with a carbon numbers of one or more (preferably 1-6) saturation or partial saturation, Or are a fluoro alkyl group, and R47, R48, R49, R50, R51, and R52 are identitases mutually, or differ. it is the

hydrocarbon group of with a carbon numbers of one or more (preferably 1-6) saturation or partial saturation, or a fluoro alkyl group, n is the integer of 0-5, m is the integer of 0-3, and l is the integer of 0-3. R43 is the aryl group which may have the hydrocarbon group of with a hydrogen atom and a carbon numbers of one or more saturation or partial saturation, or a substituent.]

[0011] As for the compound of this invention, more specifically, what is expressed with the following general formula (12), (13), (14), (15), (16), (17), or (18) is good.

[Formula 137]

(However, in said general formula (12), R53 is the aryl group which may have the hydrocarbon group of the saturation of carbon numbers 1-6, or partial saturation, or a substituent, and R54 is the aryl group which may have the hydrocarbon group of the saturation of a hydrogen atom and carbon numbers 1-6, or partial saturation, or a substituent.)

[Formula 138]

(However, in said general formula (13), R55 is the aryl group which may have the hydrocarbon group of the saturation of carbon numbers 1-6, or partial saturation, a trifluoromethyl radical, or a substituent, and R56 is the aryl group which may have the hydrocarbon group of the saturation of a hydrogen atom and carbon numbers 1-6, or partial saturation, or a substituent.)

[Formula 139]

(However, in said general formula (14), R57 and R58 are the aryl groups which may have the hydrocarbon group of the saturation of carbon numbers 1-6, or partial saturation, a trifluoromethyl radical, or a substituent, and R59 is the aryl group which may have the hydrocarbon group of the saturation of a hydrogen atom and carbon numbers 1-6, or partial saturation, or a substituent.)

[Formula 140]

(However, in said general formula (15), R60 is the aryl group which may have the hydrocarbon group of the saturation of carbon numbers 1-6, or partial saturation, or a substituent, and R61 is the aryl group which may have the hydrocarbon group of the saturation of a hydrogen atom and carbon numbers 1-6, or partial saturation, or a substituent.)

[Formula 141]

(However, in said general formula (16), R62 is the aryl group which may have the hydrocarbon group of the saturation of carbon numbers 1-6, or partial saturation, or a substituent, and R63 is the aryl group which may have the hydrocarbon group of the saturation of a hydrogen atom and carbon numbers 1-6, or partial saturation, or a substituent.)

[Formula 142]

(However, in said general formula (17), R64 is the aryl group which may have

the hydrocarbon group of the saturation of carbon numbers 1-6, or partial saturation, or a substituent, and R65 is the aryl group which may have the hydrocarbon group of the saturation of a hydrogen atom and carbon numbers 1-6, or partial saturation, or a substituent.)

[Formula 143]

(However, in said general formula (18), R66 and R67 are the aryl groups which may have the hydrocarbon group of the saturation of carbon numbers 1-6, or partial saturation, or a substituent, and R68 is the aryl group which may have the hydrocarbon group of the saturation of a hydrogen atom and carbon numbers 1-6, or partial saturation, or a substituent.)

[0012] What the compound of this invention is expressed with following structure-expression (19)-1, (19)-2, (19)-3, (19)-4, (19)-5, (19)-6, (19)-7, (19)-8, (19)-9, (19)-10, (19)-11, or (19)-12 to is illustrated concretely.

[Formula 144]

[Formula 145]

[Formula 146]

[Formula 147]

[Formula 148]

[0013] As for the compound of this invention, what is expressed with the following general formula is desirable.

[Formula 149]

however, in said general formula (20), Ar1 and Ar2 may have a substituent, respectively -- mutual -- identitas -- or the radical which is a different aryl group and was chosen from the aryl group expressed with the following general formula (6), (7), (8), (9), (10), and (11) when it has a substituent -- it is --

[Formula 150]

[Formula 151]

(However, it sets to said general formula (6), (7), (8), (9), (10), and (11).) R44, R45, R45, and R46 The hydrocarbon group of with a carbon numbers of one or more (preferably 1-6) saturation or partial saturation, It is a fluoro alkyl group. Identitas mutually R47, R48, R49, R50, R51, and R52 Or or the hydrocarbon group of with a different carbon numbers of one or more (preferably 1-6) saturation or partial saturation, or it is a fluoro alkyl group, n is the integer of 0-5, m is the integer of 0-3, and l is the integer of 0-3. R69 is the aryl group which may have the hydrocarbon group of with a hydrogen atom and a carbon numbers of one or more saturation or partial saturation, or a substituent.]

[0014] More specifically, the compound of this invention is good to be expressed with the following general formula (21), (22), (23), (24), (25), (26), or (27).

[Formula 152]

(However, in said general formula (21), R70 is the aryl group which may have

the hydrocarbon group of the saturation of carbon numbers 1-6, or partial saturation, or a substituent, and R71 is the aryl group which may have the hydrocarbon group of the saturation of a hydrogen atom and carbon numbers 1-6, or partial saturation, or a substituent.)

[Formula 153]

(However, in said general formula (22), R72 is the aryl group which may have the hydrocarbon group of the saturation of carbon numbers 1-6, or partial saturation, a trifluoromethyl radical, or a substituent, and R73 is the aryl group which may have the hydrocarbon group of the saturation of a hydrogen atom and carbon numbers 1-6, or partial saturation, or a substituent.)

[Formula 154]

(However, in said general formula (23), R74 and R75 are the aryl groups which may have the hydrocarbon group of the saturation of carbon numbers 1-6, or partial saturation, a trifluoromethyl radical, or a substituent, and R76 is the aryl group which may have the hydrocarbon group of the saturation of a hydrogen atom and carbon numbers 1-6, or partial saturation, or a substituent.)

[Formula 155]

(However, in said general formula (24), R77 is the aryl group which may have the hydrocarbon group of the saturation of carbon numbers 1-6, or partial saturation, or a substituent, and R78 is the aryl group which may have the

hydrocarbon group of the saturation of a hydrogen atom and carbon numbers 1-6, or partial saturation, or a substituent.)

[Formula 156]

(However, in said general formula (25), R79 is the aryl group which may have the hydrocarbon group of the saturation of carbon numbers 1-6, or partial saturation, or a substituent, and R80 is the aryl group which may have the hydrocarbon group of the saturation of a hydrogen atom and carbon numbers 1-6, or partial saturation, or a substituent.)

[Formula 157]

(However, in said general formula (26), R81 is the aryl group which may have the hydrocarbon group of the saturation of carbon numbers 1-6, or partial saturation, or a substituent, and R82 is the aryl group which may have the hydrocarbon group of the saturation of a hydrogen atom and carbon numbers 1-6, or partial saturation, or a substituent.)

[Formula 158]

(However, in said general formula (27), R82 and R83 are the aryl groups which may have the hydrocarbon group of the saturation of carbon numbers 1-6, or partial saturation, or a substituent, and R85 is the aryl group which may have the hydrocarbon group of the saturation of a hydrogen atom and carbon numbers 1-6, or partial saturation, or a substituent.)

[0015] What the compound of this invention is expressed with following structure-expression (28)-1, (28)-2, (28)-3, (28)-4, (28)-5, (28)-6, (28)-7, (28)-8, (28)-9, (28)-10, (28)-11, or (28)-12 to is illustrated concretely.

[Formula 159]

[Formula 160]

[Formula 161]

[Formula 162]

[Formula 163]

[0016] As for the compound of this invention, what is expressed with the following general formula is desirable.

[Formula 164]

however, in said general formula (29), Ar1 and Ar2 may have a substituent, respectively -- mutual -- identitas -- or the radical which is a different aryl group and was chosen from the aryl group expressed with the following general formula (6), (7), (8), (9), (10), and (11) when it has a substituent -- it is --

[Formula 165]

[Formula 166]

(However, it sets to said general formula (6), (7), (8), (9), (10), and (11).) R44, R45, and R46 The hydrocarbon group of with a carbon numbers of one or more (preferably 1-6) saturation or partial saturation, Or are a fluoro alkyl group, and

R47, R48, R49, R50, R51, and R52 are identitases mutually, or differ. it is the hydrocarbon group of with a carbon numbers of one or more (preferably 1-6) saturation or partial saturation, or a fluoro alkyl group, n is the integer of 0-5, m is the integer of 0-3, and l is the integer of 0-3. R86 is the aryl group which may have the hydrocarbon group of with a hydrogen atom and a carbon numbers of one or more saturation or partial saturation, or a substituent.]

[0017] As for the compound of this invention, more specifically, what is expressed with the following general formula (30), (31), (32), (33), (34), (35), or (36) is good.

[Formula 167]

(However, in said general formula (30), R87 is the aryl group which may have the hydrocarbon group of the saturation of carbon numbers 1-6, or partial saturation, or a substituent, and R88 is the aryl group which may have the hydrocarbon group of the saturation of a hydrogen atom and carbon numbers 1-6, or partial saturation, or a substituent.)

[Formula 168]

(However, in said general formula (31), R89 is the aryl group which may have the hydrocarbon group of the saturation of carbon numbers 1-6, or partial saturation, a trifluoromethyl radical, or a substituent, and R90 is the aryl group which may have the hydrocarbon group of the saturation of a hydrogen atom

and carbon numbers 1-6, or partial saturation, or a substituent.)

[Formula 169]

(However, in said general formula (32), R91 and R92 are the aryl groups which may have the hydrocarbon group of the saturation of carbon numbers 1-6, or partial saturation, a trifluoromethyl radical, or a substituent, and R93 is the aryl group which may have the hydrocarbon group of the saturation of a hydrogen atom and carbon numbers 1-6, or partial saturation, or a substituent.)

[Formula 170]

(However, in said general formula (33), R94 is the aryl group which may have the hydrocarbon group of the saturation of carbon numbers 1-6, or partial saturation, or a substituent, and R95 is the aryl group which may have the hydrocarbon group of the saturation of a hydrogen atom and carbon numbers 1-6, or partial saturation, or a substituent.)

[Formula 171]

(However, in said general formula (34), R96 is the aryl group which may have the hydrocarbon group of the saturation of carbon numbers 1-6, or partial saturation, or a substituent, and R97 is the aryl group which may have the hydrocarbon group of the saturation of a hydrogen atom and carbon numbers 1-6, or partial saturation, or a substituent.)

[Formula 172]

(However, in said general formula (35), R98 is the aryl group which may have the hydrocarbon group of the saturation of carbon numbers 1-6, or partial saturation, or a substituent, and R99 is the aryl group which may have the hydrocarbon group of the saturation of a hydrogen atom and carbon numbers 1-6, or partial saturation, or a substituent.)

[Formula 173]

(However, in said general formula (36), R100 and R101 are the aryl groups which may have the hydrocarbon group of the saturation of carbon numbers 1-6, or partial saturation, or the substituent, and R102 is the aryl group which may have the hydrocarbon group of the saturation of a hydrogen atom and carbon numbers 1-6, or partial saturation, or a substituent.)

[0018] What the compound of this invention is expressed with following structure-expression (37)-1, (37)-2, (37)-3, (37)-4, (37)-5, (37)-6, (37)-7, (37)-8, (37)-9, (37)-10, (37)-11, or (37)-12 to is illustrated concretely.

[Formula 174]

[Formula 175]

[Formula 176]

[Formula 177]

[Formula 178]

[0019] The compound of this invention can also illustrate the following

compound besides the above (however, shown also including what overlapped in part).

[Formula 179]

[Formula 180]

[Formula 181]

[Formula 182]

[Formula 183]

[Formula 184]

[Formula 185]

[Formula 186]

[Formula 187]

[Formula 188]

[Formula 189]

[Formula 190]

[Formula 191]

[Formula 192]

[Formula 193]

[0020] This invention also offers the manufacture approach of this invention of obtaining the amino styryl anthracene compound shown by said general formula [I], [II], [III], or [IV], as an approach of manufacturing the compound of this

invention efficient again, by carrying out condensation of the phosphonium salt and; which are expressed with the phosphonate or the following general formula [VII] expressed with the amino benzaldehyde expressed with the following general formula [V], and the; following general formula [VI].

[Formula 194]

(However, in said general formula [V], R103 and R104 are the radicals equivalent to said R1, R2, R11, R12, R21, R22, R38, or R39, respectively.)

[Formula 195]

(However, in said general formula [VI] and [VII], R105 is a hydrocarbon group (preferably saturated hydrocarbon radical of carbon numbers 1-4), R106 and R107 are the radicals equivalent to said R3, R4, R13, R14, R23, R24, R40, or R41, respectively, R108 is a radical equivalent to said R5, R16, R25, or R42, and X is a halogen atom.)

[0021] The manufacture approach of the compound of this invention performs said condensation by the Wittig-Horner (Wittig-Horner) reaction or the Wittig (Wittig) reaction, by processing said phosphonate and/or said phosphonium salt by the base in a solvent, makes a carbanion generate and, specifically, carries out condensation of this carbanion and said amino benzaldehyde.

[0022] For example, it faces obtaining the amino styryl anthracene compound expressed with the following general formula (5), and is [Formula 196].

[-- however, in said general formula (5), Ar1, Ar2, and R43 are the same as said thing carried out respectively.] Condensation of the phosphonium salt and; which are expressed with the phosphonate or the following general formula (40) expressed with 4-(N and N-diaryl amino) benzaldehyde expressed with the following general formula (38) and the; following general formula (39) is carried out.

[Formula 197]

(However, in said general formula (38), (39), and (40), Ar1, Ar2, R105, and X are the same as the above mentioned thing.)

[0023] If this reaction is expressed with a scheme, it will become, for example like the reaction scheme 1.

[Formula 198]

[0024] First, by processing a general formula (39) or the compound of (40) with a base in a suitable solvent, this reaction begins from generating a carbanion and is completed by next condensing this carbanion with the aldehyde of a general formula (38). The following can be considered as a combination of a base and a solvent.

[0025] Sodium-hydroxide/water, sodium-carbonate/water, potassium carbonate/water, and sodium-ethoxide/ethanol/or dimethylformamide, Sodium methoxide / methanol-diethylether mixed solvent, or dimethylformamide,

Triethylamine / ethanol, a jig lime, chloroform, or nitromethane, A pyridine / methylene chloride or nitromethane, 1, 5-JISAZA bicyclo [4.3.0] non-5-en / dimethyl sulfoxide, Potassium t-butoxide / dimethyl sulfoxide, a tetrahydrofuran, benzene, or dimethylformamide, A phenyl lithium / diethylether or a tetrahydrofuran, t-butyl lithium / diethylether, or a tetrahydrofuran, Sodium amide/ammonia, sodium hydride / dimethylformamide or a tetrahydrofuran, triethyl sodium / diethylether, or a tetrahydrofuran.

[0026] This reaction advances comparatively at low temperature (-30 degrees C - 30 degrees C), and in addition to purification of the specified substance by the chromatography being easy since it is alternative, since the compound of this invention of a general formula (5) has high crystallinity, it can raise purity with recrystallization. Although not asked especially about the approach of recrystallization, in the approach of dissolving in an acetone and adding a hexane, or toluene, the heating dissolution is carried out and the approach of condensing and cooling is simple. Ordinary pressure may perform this reaction in 3 - 24 hours.

[0027] By the manufacture approach of the compound of this invention, said general formula (12), (13), (14), (15), (16), (17), (18), (21), (22), (23), (24), (25), (26), (27), (30), (31), The amino styryl anthracene compound expressed with (32), (33), (34), (35), or (36) can be obtained. Specifically Said structure

expression (19) -1, (19) -2, (19) -3, (19) -4, (19) -5, (19) -6, (19) -7, (19) -8, (19) -9, (19) -10, (19) -11, (19) -12, (28) -1, (28) -2, (28) -3, (28) -4, (28) -5, (28) -6, (28) -7, (28) -- 8 and (28) -- 7, and -8 and (-9, (28)-10, and (28) -11 and (28) -12 and (37) -1 and (37) -2 and (37) -3 and (37) -4 and (37) -5 and (37) -6 and (37) -7) (37) (37) (37)- [-9 and / -10 and] 11 Or the amino styryl anthracene compound expressed with (37)-12 can be obtained.

[0028] This invention also offers various compounds suitable as synthetic intermediate field of the compound of this invention again.

[0029] That is, they are the phosphonate expressed with said general formula [VI] used as synthetic intermediate field of the amino styryl anthracene compound expressed with said general formula [I], [II], [III], or [IV], or the phosphonium salt expressed with said general formula [VII].

[0030] This synthetic intermediate field (the synthetic intermediate field 1 of this invention are called hereafter.) are specifically expressed with the following general formula (39), (40), (41), (42), (43), or (44).

[Formula 199]

[Formula 200]

[Formula 201]

[0031] The synthetic intermediate field of this invention can be drawn as follows from the synthetic intermediate field as the precursor.

[0032] The phosphonate expressed with said general formula [VI] or the phosphonium salt expressed with said general formula [VII] is obtained as synthetic intermediate field by making the aryl halide compound expressed with the following general formula [VIII], and the phosphite trialkyl or triphenyl phosphine (PPh_3) expressed with the following general formula [IX] react. This reaction is good as 30 minutes - reaction-time 24 hours at the reaction temperature of 120 degrees C - 160 degrees C, and ordinary pressure in solvents, such as a xylene which has a non-solvent or the boiling point 120 degrees C or more, or the phosphite trialkyl of an overlarge.

[Formula 202]

(However, in said general formula [VIII], R106 and R107 are radicals which are identitas mutually or are different, those at least one is a hydrogen atom, a cyano group, a nitro group, or a halogen atom, R108 is the aryl group which may have the hydrocarbon group of with a hydrogen atom and a carbon numbers of one or more (preferably 1-6) saturation or partial saturation, or a substituent, and X is a halogen atom.)

General formula [IX] : $\text{P}(\text{OR105})_3$ (however, in said general formula [IX], R105 is a hydrocarbon group, especially the saturated hydrocarbon radical of carbon numbers 1-4.)

[0033] This invention also offers the aryl halide compound (the synthetic

intermediate field 2 of this invention are called hereafter.) expressed with said general formula [VIII] as synthetic intermediate field for obtaining the synthetic intermediate field 1 again.

[0034] The synthetic intermediate field 2 of this invention can be obtained by making the anthracene compound expressed with the following general formula [X], and N-halogenation succinimide expressed with the following general formula [XI] react to the bottom of an optical exposure. For example, it is made to react by the reaction time of 30 - 48 hours by the temperature of 20-120 degrees C, and ordinary pressure among solvents, such as a carbon tetrachloride, chloroform, benzene, and a chlorobenzene, using the light source of a high pressure mercury vapor lamp, a low pressure mercury lamp, a xenon LGT, a halogen LGT, daylight, a fluorescent lamp, etc.

[0035]

[Formula 203]

(However, in a general formula [X], R106 and R107 are radicals which are identitas mutually or are different, those at least one is a hydrogen atom, a cyano group, a nitro group, or a halogen atom, and R108 is the aryl group which may have the hydrocarbon group of with a hydrogen atom and a carbon numbers of one or more (preferably 1-6) saturation or partial saturation, or a substituent.)

[0036]

[Formula 204]

(However, in said general formula [XI], X is a halogen atom.)

[0037] The following reaction scheme 2 can show the reaction which obtains each synthetic intermediate fields 1 and 2 described above, respectively.

[0038]

[Formula 205]

[0039] Drawing 10 - drawing 13 show the example of the organic electroluminescence devices (EL element) which use the compound of this invention as an organic luminescent material, respectively.

[0040] Drawing 10 is the transparency mold organic electroluminescence devices A to which the luminescence light 20 penetrates cathode 3, and the luminescence light 20 can be observed also from a protective layer 4 side.

Drawing 11 shows the reflective mold organic electroluminescence devices B which also obtain the reflected light in cathode 3 as a luminescence light 20.

[0041] Among drawing, one is a substrate for forming organic electroluminescence devices, and can use glass, plastics, and other proper ingredients. Moreover, a substrate can also be shared when using organic electroluminescence devices combining other display devices. 2 is a transparent electrode (anode plate) and can use ITO (Indium tin oxide) and SnO₂ grade.

[0042] Moreover, 5 is an organic luminous layer and contains the compound of

this invention as a luminescent material. About this luminous layer, well-known various configurations can be conventionally used as lamination which obtains organic electroluminescence 20. When the ingredient which constitutes an electron hole transportation layer or an electron transport layer has a luminescence so that it may mention later for example, the structure which carried out the laminating of these thin films can be used. Furthermore, in order to raise charge transportability ability in the range which fills the purpose of this invention, both an electron hole transportation layer, and both [either or] bar using the structure which carried out the laminating of the thin film of two or more sorts of ingredients, or the thin film which consists of a presentation which mixed two or more sorts of ingredients. Moreover, in order to improve the luminescence engine performance, the ingredient of at least one or more sorts of fluorescence may be used, and the structure which pinched this thin film between the electron hole transportation layer and the electron transport layer, and the structure where the ingredient of at least one or more sorts of fluorescence was further included in an electron hole transportation layer, electron transport layers, or these both may be used. In order to improve luminous efficiency in these cases, it is also possible to include the thin film for controlling transportation of an electron hole or an electron in the lamination.

[0043] Since the compound of this invention has both electronic transportability

ability and electron hole transportability ability, it can be used during a component configuration also as a luminous layer which served as the electron hole transportation layer also as a luminous layer which served both as the electron transport layer. Moreover, it is also possible to consider as the configuration put in the electron transport layer and the electron hole transportation layer by making the compound of this invention into a luminous layer.

[0044] In addition, among drawing 10 and drawing 11, three are cathode and can use the alloy of a metal [activity / calcium / Li, Mg,] and metals, such as Ag, aluminum, and In, or the structure which carried out the laminating of these as an electrode material. In the organic electroluminescence devices of a transparency mold, the light transmittance suitable for an application can be obtained by adjusting the thickness of cathode. Moreover, four in drawing is the closure and a protective layer, and the effectiveness goes up it by making the organic whole electroluminescence devices into wrap structure. A proper ingredient can be used if airtightness is maintained. Moreover, 8 is a drive power source for current impregnation.

[0045] In the organic electroluminescence devices based on this invention, the organic layer has the organic laminated structure (it is terrorism structure to a single) to which the laminating of an electron hole transportation layer and the

electron transport layer was carried out, and the compound of this invention may be used as a formation ingredient of an electron hole transportation layer or an electron transport layer. Or the organic layer has the organic laminated structure (double hetero structure) to which the laminating of an electron hole transportation layer, a luminous layer, and the electron transport layer was carried out one by one, and the compound of this invention may be used as a formation ingredient of a luminous layer.

[0046] When the example of the organic electroluminescence devices which have such an organic laminated structure is shown, drawing 3 has the laminated structure to which the laminating of organic layer 5a which consists of an anode plate 2, and the electron hole transportation layer 6 and electron transport layer 7 of translucency on the substrate 1 of translucency, and the cathode 3 was carried out one by one, and this laminated structure is the organic electroluminescence devices C of terrorism structure in the single a protective coat 4 comes for the closure to be carried out.

[0047] In the case of the lamination which omitted the luminous layer as shown in drawing 12, the luminescence light 20 of predetermined wavelength is generated from the interface of the electron hole transportation layer 6 and an electron transport layer 7. Such luminescence light is observed from a substrate 1 side.

[0048] Moreover, drawing 13 has the laminated structure to which the laminating of organic layer 5b which consists of an anode plate 2, and the electron hole transportation layer 10, the luminous layer 11 and electron transport layer 12 of translucency on the substrate 1 of translucency, and the cathode 3 was carried out one by one, and this laminated structure is the organic electroluminescence devices D of terrorism structure in the double a protective coat 4 comes for the closure to be carried out.

[0049] In the organic electroluminescence devices shown in drawing 13, the electron with which the electron hole poured in from the anode plate 2 was poured in from cathode 3 through the electron hole transportation layer 10 reaches a luminous layer 11 through an electron transport layer 12, respectively by impressing direct current voltage between an anode plate 2 and cathode 3. Consequently, the recombination of an electron/electron hole arises in a luminous layer 11, a singlet exciton generates, and luminescence of predetermined wavelength is generated from this singlet exciton.

[0050] In each organic electroluminescence devices C and D mentioned above, the ingredient of light transmission nature, such as glass and plastics, can be suitably used for a substrate 1. Moreover, when using combining other display devices, or when arranging the laminated structure shown in drawing 12 and drawing 13 in the shape of a matrix, it is good considering this substrate as

common use. Moreover, Components C and D can all take any structure of a transparency mold and a reflective mold.

[0051] Moreover, an anode plate 2 is a transparent electrode and ITO (indium tin oxide) and SnO₂ grade can be used for it. Between this anode plate 2 and the electron hole transportation layer 6 (or electron hole transportation layer 10), the thin film which consists of the organic substance or an organometallic compound may be prepared in order to improve the injection efficiency of a charge. In addition, when the protective coat 4 is formed with conductive ingredients, such as a metal, the insulator layer may be prepared in the side face of an anode plate 2.

[0052] Moreover, the electron hole transportation layer 6 and an electron transport layer 7 are organic layers by which the laminating was carried out, the compound of this invention contains organic layer 5a in the organic electroluminescence devices C to these either or both sides, and it is good as the luminescent electron hole transportation layer 6 or a luminescent electron transport layer 7. Organic layer 5b in the organic electroluminescence devices D can take various laminated structures, although the electron hole transportation layer 10, the luminous layer 11 containing the compound of this invention, and an electron transport layer 12 are organic layers by which the laminating was carried out. For example, both the electron hole transportation layer, and both

[either or] may have a luminescence.

[0053] Moreover, although it is desirable that it is the layer which the electron hole transportation layer 6 or an electron transport layer 7, and a luminous layer 11 turn into from the compound of this invention especially, these layers may be formed only with the compound of this invention, or you may form by the compound of this invention, other electron holes, or vapor codeposition with electronic transportation ingredients (for example, aromatic amine and pyrazolines etc.). Furthermore, in an electron hole transportation layer, in order to raise electron hole transportability ability, the electron hole transportation layer which carried out the laminating of two or more sorts of electron hole transportation ingredients may be formed.

[0054] Moreover, in the organic electroluminescence devices C, although a luminous layer may be the electronic transportability luminous layer 7, depending on the electrical potential difference impressed from a power source 8, light may be emitted by the electron hole transportation layer 6 or its interface. Similarly, in the organic electroluminescence devices D, a luminous layer may be an electron transport layer 12 in addition to layer 11, and may be the electron hole transportation layer 10. In order to raise the luminescence engine performance, it is good that it is the structure where the luminous layer 11 which used at least one sort of fluorescence ingredients was made to pinch between

an electron hole transportation layer and an electron transport layer. Or the structure where an electron hole transportation layer, an electron transport layer, or both [these] layers were made to contain this fluorescence ingredient may be constituted. In such a case, in order to improve luminous efficiency, it is also possible to include the thin films (a hole blocking layer, exciton generation layer, etc.) for controlling transportation of an electron hole or an electron in the lamination.

[0055] Moreover, you may be the structure in which could use the alloy of a metal [activity / calcium / Li, Mg,] and metals, such as Ag, aluminum, and In, as an ingredient used for cathode 3, and these metal layers carried out the laminating. In addition, the organic electroluminescence devices corresponding to an application are producible by choosing the thickness and the quality of the material of cathode suitably.

[0056] Moreover, a protective coat 4 acts as closure film, is making the organic whole electroluminescence devices into wrap structure, and can improve charge injection efficiency and luminous efficiency. In addition, if the airtightness is maintained, a single metal or alloys, such as aluminum, gold, and chromium, etc. can choose the ingredient suitably.

[0057] Although the current impressed to each above-mentioned organic electroluminescence devices is usually a direct current, pulse current and an

alternating current may be used. If a current value and an electrical-potential-difference value are within the limits which does not carry out component destruction, there will be especially no limit, but when the power consumption and the life of organic electroluminescence devices are taken into consideration, it is desirable to make light emit efficiently with as small electrical energy as possible.

[0058] Next, drawing 14 is the example of a configuration of the flat-surface display which used the organic electroluminescence devices of this invention. In the full color display, like illustration, red (R) and the green organic layer 5 (5a, 5b) which can emit light in the three primary colors of (G) and blue (B) are allotted between cathode 3 and an anode plate 2. It can prepare in the shape of [which crosses mutually] a stripe, it is chosen by the luminance-signal circuit 14 and the control circuit 15 with a built-in shift register, and a signal level is impressed to each, and cathode 3 and an anode plate 2 are constituted so that the organic layer of the location (pixel) where the cathode 3 and the anode plate 2 which were chosen by this cross may emit light.

[0059] That is, it is a 8x3RGB simple matrix, and drawing 14 arranges the layered product 5 which consists of one side between cathode 3 and an anode plate 2, even if there are few electron hole transportation layers, and luminous layers and electron transport layers either (refer to drawing 12 or drawing 13).

Both cathode and an anode plate are made to intersect perpendicularly in the shape of a matrix mutually, impress a signal level serially by the control circuits 15 and 14 with a built-in shift register, and they are constituted so that light may be emitted in the decussation location, while carrying out patterning to the shape of a stripe. Of course, the EL element of this configuration can be used also as picture reproducer as a display of an alphabetic character, a notation, etc. Moreover, the stripe-like pattern of cathode 3 and an anode plate 2 is arranged for every color of red (R), green (G), and blue (B), and it becomes possible to constitute multicolor or all full color solid-state mold flat-panel displays.

[0060]

[Example] Hereafter, although this invention is concretely explained about an example, this invention is not limited to the following examples.

[0061] Example 1 <example of composition of amino styryl anthracene compound (structure expression (19) -7)> [0062]

[Formula 206]

[0063] Sodium hydride (mineral oil is entered) 3.75mmol was measured in the reaction container, and anhydrous tetrahydrofuran 5mL was made to suspend under nitrogen-gas-atmosphere mind. Stirring at a room temperature, 6:1 mixed-solution 70mL of an anhydrous tetrahydrofuran and anhydrous dimethylformamide (471mg ((39) -1) (1.24mmol) of phosphonate and

4-[N-(1-naphthyl)-N-phenylamino] benzaldehyde ((38) -1) 521mg (1.61mmol))

was dropped, and it stirred at the room temperature for 12 hours. Reaction mixed liquor was quenched on little ice, and it washed with saturation brine, and dried with anhydrous sodium sulfate. The reaction solution was condensed and the precipitate produced by adding water was washed by water, ethanol, and the hexane.

[0064] 383mg of red crystals was obtained by a silica gel chromatography's (WAKO-gel C-300, toluene's) refining and recrystallizing [toluene]. This identified the specified substance ((19) -7) by ¹H NMR and FAB-MS measurement (56% of yield). These analytical data were as follows.

¹ H NMR (CDCl₃), delta (ppm): 6.99-7.54 (15H, m), 7.79-7.95 (4H, m), 8.08 (2H, d) and 8.34 (1H, s), and 8.42-8.50 (3H, m) glass transition point were 137 degrees C, and the melting point was 312 degrees C.

[0065] 511nm and the fluorescence maximum wave length of the visible absorption maximum of the toluene solution of this specified substance were 615nm. Moreover, the ¹H NMR spectrum was as being shown in drawing 1.

[0066] Example 2 <example of composition of amino styryl anthracene compound ((19) -8)> [0067]

[Formula 207]

[0068] Sodium hydride (mineral oil is entered) 3.75mmol was measured in the

reaction container, and anhydrous tetrahydrofuran 5mL was made to suspend under nitrogen-gas-atmosphere mind. Stirring at a room temperature, 6:1 mixed-solution 70mL of an anhydrous tetrahydrofuran and anhydrous dimethylformamide (471mg ((39) -1) (1.24mmol) of phosphonate and 4-[N-(4-methoxyphenyl)-N-(1-naphthyl) amino] benzaldehyde ((38) -2) 521mg (1.47mmol)) was dropped, and it stirred at the room temperature for 12 hours. Reaction mixed liquor was quenched on little ice, and it washed with saturation brine, and dried with anhydrous sodium sulfate. The reaction solution was condensed and the precipitate produced by adding water was washed by water, ethanol, and the hexane.

[0069] 417mg of red crystals was obtained by a silica gel chromatography's (WAKO-gel C-300, toluene's) refining and recrystallizing [toluene]. This identified the specified substance ((19) -8) by ¹H NMR and FAB-MS measurement (34% of yield). These analytical data were as follows.

¹H NMR(CDCl₃) delta(ppm): -- 3.80 (3H, s), 6.86 (4H, d), and 7.14- 7.53 (1H, d), 7.81 (3H, m), 7.90-7.98 (2H, m), 8.07 (2H, d) and 8.31 (1H, s), and 8.40-8.48 (3H,

m) [0070] 527nm and the fluorescence maximum wave length of the visible absorption maximum of the toluene solution of this specified substance were 640nm. Moreover, the ¹H NMR spectrum was as being shown in drawing 2.

[0071] Example 3 <example of composition of amino styryl anthracene

compound ((19) -9)> [0072]

[Formula 208]

[0073] Sodium hydride (mineral oil is entered) 7.50mmol was measured in the reaction container, and anhydrous tetrahydrofuran 10mL was made to suspend under nitrogen-gas-atmosphere mind. Stirring at a room temperature, 3:1 mixed-solution 70mL of an anhydrous tetrahydrofuran and anhydrous dimethylformamide (500mg ((39) -1) (1.32mmol) of phosphonate and 4-[N and N-JI (1-naphthyl) amino] benzaldehyde ((38) -3) 758mg (2.03mmol)) was dropped, and it stirred at the room temperature for 12 hours. Reaction mixed liquor was quenched on little ice, and it washed with saturation brine, and dried with anhydrous sodium sulfate. The reaction solution was condensed and the precipitate produced by adding water was washed by water, ethanol, and the hexane.

[0074] 443mg of red crystals was obtained by a silica gel chromatography's (WAKO-gel C-300, toluene's) refining and recrystallizing [toluene]. This identified the specified substance ((19) -9) by ¹H NMR and FAB-MS measurement (55% of yield). These analytical data were as follows.

¹ H NMR (CDCl₃), delta (ppm): 6.70 (2H, d), 7.15-7.50 (12H, m), 7.74-7.82 (4H, m), 7.92 (2H, m), 8.06 (3H, m) and 8.31 (1H, s), and 8.41-8.49 (3H, s) glass transition point were 165 degrees C, and the melting point was 314 degrees C.

[0075] 514nm and the fluorescence maximum wave length of the visible absorption maximum of the toluene solution of this specified substance were 610nm. Moreover, the ^1H NMR spectrum was as being shown in drawing 3.

[0076] Example 4 <example of composition of amino styryl anthracene compound ((19) -10)> [0077]

[Formula 209]

[0078] Sodium hydride (mineral oil is entered) 1.56mmol was measured in the reaction container, and anhydrous tetrahydrofuran 5mL was made to suspend under nitrogen-gas-atmosphere mind. Stirring under ice-cooling, 4:1 mixed-solution 40mL of an anhydrous tetrahydrofuran and anhydrous dimethylformamide (200mg ((39) -1) (0.53mmol) of phosphonate and 4-[N-phenyl-N-(5, 6, 7, 8-tetrahydro-1-naphthyl amino)] benzaldehyde ((38) -4) 208mg (0.63mmol)) was dropped, and it stirred at the room temperature further under ice-cooling for 12 hours for 3 hours. Reaction mixed liquor was quenched on little ice, and it washed with saturation brine, and dried with anhydrous sodium sulfate. The reaction solution was condensed and the precipitate produced by adding water was washed by water, ethanol, and the hexane.

[0079] 196mg of dark reddish-brown crystals was obtained by a silica gel chromatography's (WAKO-gel C-300, toluene's) refining and recrystallizing [toluene]. This identified the specified substance ((19) -10) by ^1H NMR and

FAB-MS measurement (56% of yield). These analytical data were as follows.

delta (ppm): 1.72 (4H, m), 2.40 (2H, m) and 2.84 (2H, m), 6.94-7.44 (12H, m),
7.46 (2H, d), 7.83 (2H, m), 8.08 (1H, d) and 8.35 (1H, s), and the 8.42 -8.50 (3H,
m) melting point were 309 degrees C 1 H NMR (CDCl3).

[0080] 515nm and the fluorescence maximum wave length of the visible absorption maximum of the toluene solution of this specified substance were 630nm. Moreover, the 1H NMR spectrum was as being shown in drawing 4.

[0081] Example 5 <example of composition of amino styryl anthracene compound ((19) -11)> [0082]

[Formula 210]

[0083] Sodium hydride (mineral oil is entered) 3.75mmol was measured in the reaction container, and anhydrous tetrahydrofuran 10mL was made to suspend under nitrogen-gas-atmosphere mind. Stirring at a room temperature, 7:1 mixed-solution 80mL of an anhydrous tetrahydrofuran and anhydrous dimethylformamide (470mg ((39) -1) (1.24mmol) of phosphonate and 4-(N and N-diethylamino) benzaldehyde ((38) -5) 330mg (1.86mmol)) was dropped, and it stirred at the room temperature for 12 hours. Reaction mixed liquor was quenched on little ice, and it washed with saturation brine, and dried with anhydrous sodium sulfate.

[0084] 280mg of dark reddish-brown crystals was obtained by a silica gel

chromatography's (WAKO-gel C-300, toluene:THF=10:1) refining and recrystallizing [toluene]. This identified the specified substance ((19) -11) by 1H NMR and FAB-MS measurement (56% of yield). These analytical data were as follows.

1 H NMR (CDCl₃) delta (ppm):1.22 (6H, t), 3.43 (4H, q), 6.72 (2H, d), 7.14 (1H, d), 7.37 (1H, d), 7.50 (2H, d), 7.81 (2H, m), 8.08 (1H, d), 8.30 (2H, s), and 8.40-8.48 (3H, m) glass transition point were 109 degrees C, and the melting point was 266 degrees C.

[0085] 540nm and the fluorescence maximum wave length of the visible absorption maximum of the toluene solution of this specified substance were 665nm. Moreover, the 1H NMR spectrum was as being shown in drawing 5.

[0086] Example 6 <example of composition of amino styryl anthracene compound ((19) -6)> [0087]

[Formula 211]

[0088] Sodium hydride (mineral oil is entered) 3.75mmol was measured in the reaction container, and anhydrous tetrahydrofuran 10mL was made to suspend under nitrogen-gas-atmosphere mind. Stirring at a room temperature, 1:1 mixed-solution 120mL of an anhydrous tetrahydrofuran and anhydrous dimethylformamide (470mg ((39) -2) (1.24mmol) of phosphonate and 4-[N-(4-methoxyphenyl)-N-phenylamino benzaldehyde ((38) -6) 570mg

(1.86mmol)) was dropped, and it stirred at the room temperature for 12 hours.

Reaction mixed liquor was quenched on little ice, and it washed with saturation brine, and dried with anhydrous sodium sulfate.

[0089] 150mg of dark reddish-brown crystals was obtained by a silica gel chromatography's (WAKO-gel C-300, toluene's) refining and recrystallizing [toluene]. This identified the specified substance ((19)-6) by ^1H NMR and FAB-MS measurement (22% of yield). These analytical data were as follows.
delta (ppm): 2.67 (3H, s), 3.83 (3H, s) and 6.87 (2H, d), 6.88-7.39 (5H, m), 7.45 (2H, d), 7.65 (1H, d), 8.05 (1H, d) and 8.23 (1H, s), and the 8.33 -8.43 (3H, m) melting point were 279 degrees C ^1H NMR (CDCl_3).

[0090] 520nm and the fluorescence maximum wave length of the visible absorption maximum of the toluene solution of this specified substance were 640nm. Moreover, the ^1H NMR spectrum was as being shown in drawing 6.

[0091] Example 7 <example of composition of amino styryl anthracene compound ((19)-12)> [0092]

[Formula 212]

[0093] 0.158g (a mineral oil is entered) (3.96mmol) of sodium hydride was measured in the reaction container, and anhydrous tetrahydrofuran 20mL was made to suspend under nitrogen-gas-atmosphere mind. Stirring under ice-cooling, 9:1 mixed-solution 40mL of an anhydrous tetrahydrofuran and

anhydrous dimethylformamide (200mg ((39) -1) (0.53mmol) of phosphonate and 4-[N and N-(1-naphthyl-4-trifluoro methylphenyl)] benzaldehyde ((38) -7) 621mg (1.59mmol)) was dropped, and it stirred under ice-cooling for 12 hours. Reaction mixed liquor was quenched on little ice, and after extracting with toluene and washing with saturation brine, it dried on anhydrous sodium sulfate.

[0094] 371mg of dark reddish-brown crystals was obtained by a silica gel chromatography's (WAKO-gel C-300, a toluene:hexane's ='s 1:4) refining, and recrystallizing [hexane / acetone-]. This identified the specified substance ((19) -12) by ¹H NMR and FAB-MS measurement (46% of yield). These analytical data were as follows.

¹H NMR(CDCI₃) delta(ppm): -- 7.08 (2H, d), 7.15 (2H, d), 7.35-7.57 (10H, m), 7.80-7.89 (4H, m), 7.94 (1H, d), 8.07 (1H, d) and 8.37 (1H, s), and 8.44-8.50 (3H, m) glass transition point were 134 degrees C, and the melting point was 303 degrees C.

[0095] 510nm and the fluorescence maximum wave length of the visible absorption maximum of the toluene solution of this specified substance were 617nm (this specified substance is interesting at the point that a chromaticity is close to a red certified value compared with the compound ((19) -7) of an example 1). Moreover, the ¹H NMR spectrum was as being shown in drawing 7.

[0096] Example 8 <example of composition of phosphonate ((39) -1)> [0097]

[Formula 213]

[0098] Xylene 60mL was made to suspend 2-(bromomethyl) anthracene -9 and 10-JIKARUBO nitril ([VIII] -1) 947mg (2.95mmol), and it stirred at 125 degrees C after dropping phosphorous acid tributyl 2.48g (14.9mmol) for 15 hours.

[0099] The reaction solution was cooled to the room temperature, and hexane 100mL was added and put, produced precipitate was carried out the ** exception, it washed repeatedly by the hexane, and 942mg of yellow crystals was obtained. This identified the specified substance ((39) -1) by 1HNMR and FAB-MS measurement (84% of yield). These analytical data were as follows.

delta (ppm):1.30 (6H, t), 3.47 (4H, d), 4.12 (8H, q), 7.85 (3H, m) and 8.38 (1H, d), and a 8.51(3H, m) 1H NMR spectrum were as being shown in drawing 8 1 H NMR (CDCl₃).

[0100] Example 9 <example of composition of 2-(bromomethyl) anthracene -9 and 10-JIKARUBO nitril ([VIII] -1)> [0101]

[Formula 214]

[0102] After dissolving and carrying out the nitrogen purge of the 2-anthracene -9 and 10-JIKARUBO nitril ([X] -1) 800mg (3.30mmol) to chloroform 200mL, 5.76g (32.4mmol) of N-bromosuccinimide was added in 6 steps every 12 hours, flowing back.

[0103] The reaction solution was condensed, alumina chromatography (300

meshes of activated aluminas, chloroform) refined, produced precipitate was carried out the ** exception, it washed repeatedly by the hexane, and 947mg of yellow crystals was obtained. This identified the specified substance ([VIII] -1) by ¹H NMR and FAB-MS measurement (89% of yield). These analytical data were as follows.

¹H NMR(CDCI₃) delta(ppm): -- 4.75 (2H, s), 7.88 (3H, m), and a 8.47-8.55(4H, m) ¹H NMR spectrum were as being shown in drawing 9.

[0104]

[Function and Effect of the Invention] The compound of this invention can be effectively used as an organic luminescent material which shows strong luminescence of yellow - red depending on the substituent introduced into the structure, it is the matter which has a high glass transition point and the high melting point, and it excels in electric, thermal, or chemical stability, and it is amorphous and a vitreous state can be formed easily, and also has sublimability and can also form the uniform amorphous film with vacuum deposition etc. while excelling in thermal resistance. Moreover, the compound of this invention can be manufactured by the general and efficient approach through the synthetic intermediate field of this invention.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] It is 1H NMR spectrum Fig. of the compound by the example 1 of this invention.

[Drawing 2] It is 1H NMR spectrum Fig. of the compound by the example 2 of this invention.

[Drawing 3] It is 1H NMR spectrum Fig. of the compound by the example 3 of this invention.

[Drawing 4] It is 1H NMR spectrum Fig. of the compound by the example 4 of this invention.

[Drawing 5] It is 1H NMR spectrum Fig. of the compound by the example 5 of this invention.

[Drawing 6] It is 1H NMR spectrum Fig. of the compound by the example 6 of this invention.

[Drawing 7] It is 1H NMR spectrum Fig. of the compound by the example 7 of this invention.

[Drawing 8] It is 1H NMR spectrum Fig. of the compound by the example 8 of this invention.

[Drawing 9] It is 1H NMR spectrum Fig. of the compound by the example 9 of

this invention.

[Drawing 10] It is the important section outline sectional view of the organic electroluminescence devices based on this invention.

[Drawing 11] It is the important section outline sectional view of organic electroluminescence devices besides ****.

[Drawing 12] It is the important section outline sectional view of organic electroluminescence devices besides ****.

[Drawing 13] It is the important section outline sectional view of **** and also other organic electroluminescence devices.

[Drawing 14] It is the block diagram of the full color flat-surface display using **** organic electroluminescence devices.

[Description of Notations]

1 [-- A protective coat, 5, 5a, 5b / -- An organic layer, 6 / -- An electron hole transportation layer, 7 / -- An electron transport layer, 8 / -- A power source, 10 / -- An electron hole transportation layer, 11 / -- A luminous layer, 12 / -- An electron transport layer, 14 / -- A luminance-signal circuit, 15 / -- A control circuit, 20 / -- Luminescence light, A B C, D / -- Organic electroluminescence devices] --
A substrate, 2 -- A transparent electrode (anode plate), 3 -- Cathode, 4